Fred L. Hartley Research Center
Unocal Corporation
376 South Valencia Avenue
Brea, California 92621
Telephone (714) 528-7201

UNOCAL

TELECOPIER INFORMATION SHEET

URGENT - PLEASE HAND DELIVER

Date: July 5, 1995

Company Name: U.S. PTO

Attention: Examiner Helane Myers

City, State: Washington, D. C.

Facsimile No. (703) 305-3599

Reference No. Serial No. 08/409,074 filed 3/22/95

Pages 75
(INCLUDING COVER SHEET)

Enclosed is Information Disclosure Statement No. 11

A confirmation copy will be hand-delivered early next week.

FROM: GREGORY F. WIRZBICKI

UNOCAL CORPORATION
FRED L. HARTLEY RESEARCH CENTER
P.O. BOX 7600, BREA, CA 92622-7600

TELECOPY NUMBER TO PATENT DEPARTMENT: (714) 577-1230

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#36

Docket No. 0390112

Examiner Helane Myers
Group Art Unit 1106

In re application:
PETER J. JESSUP ET AL.

PATENT

Serial No. 08/409,074
Filed: March 22, 1995

GASOLINE FUEL

Assistant Commissioner For Patents
Washington, D. C. 20231

Dear Sir:

INFORMATION DISCLOSURE STATEMENT NO. 11

With respect to the above-identified application, applicants have yet further information to present to the Examiner in charge of the above-identified application.

Because the information to be presented relates to three matters unrelated to each other, applicants have broken this IDS No. 11 into three sections, A, B, and C, all attached.

Although no fee is believed due for this IDS No. 11, if the USPTO determines otherwise, please charge the appropriate fee to deposit account number 21-0175.

Respectfully submitted,

Gregory F. Wirzbicki
Attorney for Applicants
Registration No. 27,606
(714) 577-1250

July 5, 1995

Union Oil Company of California
P. O. Box 7600
Brea, CA 92622-7600

TEST FUELS FOR REFORMULATED GASOLINE STUDY – target specs.

Fuel No.	RON	(MON)	RVP psi	T50 °F	T90 °F	Arom. vol.%	Olef. vol.%	MTBE vol.%	Comments
1	97	87	8.0 (0.56)	203 (95)	320 (160)	30	12	0	Base Case
2	97	87	8.0	185 (85)	320	30	12	0	T50 Reduction
3	97	87	8.0	239 (110)	320	30	12	0	T50 Increase
4	97	87	7.0 (0.49)	203	320	30	12	0	RVP Reduction
5	97	87	10.0 (0.70)	203	320	30	12	0	RVP Increase
6	97	87	8.0	203	320	15	12	0	Arom. Contents Reduction
7	97	87	8.0	203	320	30	0	0	Olef. Contents Reduction
8	97	87	8.0	203	320	30	12	7	MTBE Blend (Medium Conc.)
9	97	87	8.0	203	320	30	12	15	MTBE Blend (Maximum Conc.)
10	97	87	8.0	203	293 (145)	30	12	0	T90 Reduction

x x x x x x

AKI = 92

x = variables.

driveability
FTP emissions

Toyota wants tight control of T50 in reformulated gasolines.

T50 85→100 °C
– pushing @ CARB

Saw 50% change in emissions by changing T50.

INFORMATION DISCLOSURE STATEMENT NO. 11
Section A

With respect to the above identified application, the applicants request consideration of the following documents (copies enclosed) relating to research performed by Toyota Motor Corporation:

1. **"Test Gasoline Matrix"** a two page document with all handwritten marginalia by one of the present applicants, Dr. Peter J. Jessup, said marginalia indicating on the first page a date of July 17, 1990. (Note: because it may be difficult in the future to obtain a copy of this document should it get misplaced from applicants' file history, a copy is attached to this IDS No. 11 as **Attachment T1** for permanent record in the file. A further, loose copy is also enclosed for the convenience of the Examiner.)

2. "Effect of Gasoline Property on Exhaust Emissions and Driveability," Toyota Motor Corporation, dated October, 1990. (Note: this document is 19 pages in length, and for convenience of future reference in this prosecution, applicants' attorney has numbered the pages in the lower right hand corner. Also, because it may be difficult in future to obtain a copy of this document should it get misplaced from applicants' file history, a copy is attached to this IDS No. 11 as **Attachment T2** for permanent record in the file. A further, loose copy is also enclosed for the convenience of the Examiner.)

3. **SAE 902094**, "Effects of Gasoline Composition on Exhaust Emissions and Driveability," Hoshi et al., dated October 22-25, 1990

Applicants' first comment with respect to the above

identified documents relating to research work by Toyota Motor Company is that none of such documents is admitted prior art. Indeed, quite the opposite, applicants deny that **any** of such documents is prior art. In applicants' grandparent application, a 131 affidavit was submitted establishing that they had, prior to February 28, 1990, prepared a gasoline composition having, inter alia, a low RVP and a low T50 (i.e., 6.25 psi & 207° F., respectively). In addition, although not specified in said affidavit, the applicants had, prior to the end of June, 1990, developed the equations pertaining to Example 1 of the specification (see pages 11 and 14-22), which equations establish, inter alia, that lowering T50 lowers HC and CO emissions and lowering RVP lowers NOx emissions. (See specification, page 11, line 28 to page 12, line 26). If necessary, applicants can provide another 131 affidavit proving the foregoing, but such an affidavit is **not** believed necessary, **and this for the simple reason that the three above-identified Toyota documents fail to teach or suggest the invention claimed.**

In particular, these references fail to teach or suggest the invention **at least** for the reason that, although they disclose many gasoline compositions, **not one falls within the scope of a gasoline as required in a claim at issue.**

With the foregoing as background, applicants now direct the Examiner's attention to the first two documents above listed. Dr. Peter Jessup, one of the inventors herein, received these materials from a representative of Toyota, Mr. Jonathan Haines, in 1990. In the discussion to follow, the statements concerning communications between Dr. Jessup and Mr. Haines, and the mental conclusions and impressions of Dr. Jessup, are not based on the personal knowledge of the undersigned attorney but upon statements made to him by Dr. Jessup. An affidavit of Dr. Jessup providing

supporting evidence of these statements will soon be submitted to the USPTO.

On July 17, 1990 Mr. Haines visited Unocal's Brea research facility and, in a meeting with Dr. Peter J. Jessup and others, disclosed the target fuels of a Toyota experiment pertaining to gasolines and exhaust emissions. Mr. Haines presented the first document listed above (a two-page document, **Attachment T1**) having on its front page a cubical Test Gasoline Matrix and on the back page a table of the target properties of 10 gasolines. The ten test gasolines of the table correspond in target properties to the ten gasolines identified by circles on the gasoline matrix of the first page. All but one of the test fuels had a target RVP of 8.0 psi or more, and the one fuel (fuel 4) which had a lower RVP (of 7.0 psi) also had a T90 of 320° F., thus eliminating it as a fuel falling within the scope of any claim at issue. Hence, there are no gasolines taught in **Attachment T1** that suggest the invention claimed.

During the course of the meeting on July 17, 1990, Dr. Jessup (as he will testify) made the handwritten notes now visible on **Attachment T1**. According to one of these notes, Mr. Haines disclosed that Toyota (apparently making reference to other work not disclosed in the two-page **Attachment T1**) had data allegedly establishing that increasing T50 increased emissions. Again according to Dr. Jessup's handwritten notes, the Toyota data allegedly showed a 50% change in emissions by changing T50, from which data Toyota was in favor of tight control of T50 in reformulated gasolines and wanted CARB (the California Air Resources Board) to regulate T50 in the 85 - 100° C. range (185° - 212° F).

Subsequently, Mr Haines mailed to Dr. Jessup (on or about

October 28, 1990 as his affidavit will show), the 19 page document entitled "Effect of Gasoline Property on Exhaust Emissions and Driveability" (the second document in the list above, **Attachment T2**). Unfortunately, this document complicates matters by using two unusual units for measuring RVP (kg/cm2 and kPA), and thus a digression is needed as applicants present for the Examiner's convenience a reference table for converting RVP's from the two units of the 19 page document to understandable English units (psi):

psi	6.0	7.0	8.0	9.0	10.0	11.0
kPa	41.4	48.3	55.2	62.1	70.0	75.8
kg/cm2	0.42	0.49	0.56	0.63	0.70	0.77

Gasoline compositional data are presented in **Attachment T2** on pages 3, 4, and 8. Of these gasolines, only one (Fuel 12 on page 3) has an RVP of 7.5 psi or less. Fuel 12 has an RVP of 6.7 psi but a T50 of (110° C) 230° F. and a T90 of (161 ° C) 322° F., thus eliminating it from the scope of any claim at issue. Hence, in this 19-page Toyota document, no gasoline is taught or suggested that falls within a gasoline required in the claims, and for that reason, among others, the present invention is distinguished over the teachings of **Attachment T2**.

It should also be noted that on pages 10, 11, and 12, **Attachment T2** provides graphical RVP vs. T50 representations of survey data for commercial gasolines in 1989. But again, nothing in these graphs suggests a gasoline as required in the claims. To the contrary, these data indicate a lack of any gasolines simultaneously having an RVP no greater than 7.5 psi and a T50 no greater than 215° F. Indeed, if anything, pages 10-12 of **Attachment T2** show the Examiner that the fuels required in the claims are markedly different from the typical commercial prior art gasolines produced only a year prior to applicants' filing.

With respect to exhaust emissions, applicants call the Examiner's attention to the fact that **Attachment T2** discusses HC, CO, and NOx emissions. The 19-page Toyota document assumes that RVP will, in future, be regulated, i.e., controlled, presumably by CARB or the EPA, to some low but undefined value. See pages 6, 9 (in particular), and 17 of **Attachment T2**. In line with many of the arguments applicants have raised in the prosecution of this case before, the Toyota authors clearly recognize that, since the easiest way to drop RVP (by lowering the butane content) also increases T50 (see page 9, schematic figure in lower right hand corner), the Toyota authors aimed to study the effects on driveability[1] and emissions of high T50 gasoline.

On page 7 the Toyota authors present bar graphs allegedly showing that lowering T50 causes a decrease in CO and HC but an increase in NOx. The graphical data was based on experiments using the three gasolines described on page 8, and from these data the Toyota authors present conclusions relating T50 to CO and HC emissions.

Upon review of this document, and particularly pages 7 and 8, Dr. Jessup recognized (as his affidavit testimony will show) that Toyota's conclusion that lowering T50 results in lower HC or CO emission from the data presented on pages 7 and 8 was seriously flawed and scientifically invalid. Specifically, the three gasolines on page 8 differ widely in RVP, T10, T50, T90, as well as aromatics and olefin content. Assuming at face value that Fuel C, as shown on page 7, indeed yielded lower HC emissions than Fuel B, which in turn yielded less HC emissions than Fuel A, **this is not proof in any way that T50 caused these effects.** Granted, Fuel C

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[1] Driveability Index (DI) = 1.5 x T10 + 3 x T50 + T90 Generally speaking, the lower the DI, the better the gasoline is for combustion in an automotive engine.

has a lower T50 than Fuel B, and Fuel B a lower T50 than Fuel A, but the same could be said for density, IBP, T10 and aromatics. Each of these is highest for fuel A and lowest for fuel C.

Thus, bar charts similar to the one on page 7 could have been presented for density vs. emissions, IBP vs. emissions, T10 vs. emissions, etc. But such charts would be equally meaningless as the one Toyota shows for T50 vs. emissions. All that can be said for Toyota's data is that, assuming the experiments were properly run, Fuel A yields the highest CO and HC and lowest NOx emissions, Fuel C the lowest CO and HC emissions and highest NOx emissions, and Fuel B is in the middle. There is no scientifically sound basis for assuming that one individual fuel property was responsible for any or all of these effects, yet for some unknown reason Toyota decided that T50 caused these effects.

There are, of course, scientifically valid ways to run an experiment so that one can compare the effect of an individual property upon emissions. One way is to hold all other properties of the test fuels as constant as possible while allowing only the property of interest to be varied. Another way is to prepare test gasolines to fit a properly designed matrix and run a regression analysis on the emission results, yielding an equation which, in effect, is a predictive model. (This, of course, is the method employed in applicants' specification in the Examples; e.g., see specification, page 16, lines 13 to 30, and page 25, line 26 to page 27, line 10. And basically the same method is involved in the EPA predictive model, except that the data thereon are from a number of different tests, as opposed to a simple matrix). But one certain way **not** to obtain a scientifically valid result is to test three fuels with 5 different properties all descending in value, and when the results show that the HC and CO emissions also

decrease in descending order, then decide that one of the five properties is responsible. This is simply not scientifically valid.

Accordingly, one of ordinary skill in this art would see that there is no legitimate basis from Toyota's data in **Attachment T2** for assuming any relationship between T50 and emissions, much less Toyota's specific conclusion that lowering T50 lowers HC and CO emissions. Thus, while Toyota's conclusion that lowering T50 lowers HC and CO emissions was in agreement with Dr. Jessup's earlier finding, he did not (as his affidavit soon to be filed will show) accept the Toyota data of the 19-page document as confirmation of his earlier work.

A search on July 3, 1995 for more information regarding the Toyota work uncovered **SAE Paper No. 902094**, published at about the same time (late October, 1990) as the 19 page Toyota document **(Attachment T2)**. Again, the conclusion is made that T50 affects exhaust emissions (page 7) but since this conclusion is based on the same experiment as described above,[2] it is an equally invalid conclusion.

The SAE paper provides a number of graphs and figures (on pages 2, 3, and 4) relative to tailpipe emissions and gasoline properties other than T50. The Examiner is invited to review these graphs and figures, but none is believed to provide information suggestive of the invention.

With final reference to the SAE paper, applicants would emphasize that this document discloses gasoline compositional data

[2] Note that Fuels A, B, and C of Table 3 on page 6 of the SAE paper are the same as Fuels A, B, and C on page 8 of the 19-page document, **Attachment T2**.

including both RVP and distillation properties in Table 3 (page 6), Tables 4, 6, & 7 (page 8), and the tables on page 9 for some 44 gasolines. **Not one such gasoline falls within the scope of a gasoline as required in a claim at issue herein.** Forty-one of the 44 gasolines have an RVP of 7.6 psi or more, and the remaining three (Fuels 1 and 2 of Table 6 and Fuel 6 of Table 7) have properties (converted into English units) as follows:

SAE Paper 902094
Properties of Three Fuels Converted to English Units
(Including Paraffins by Difference)

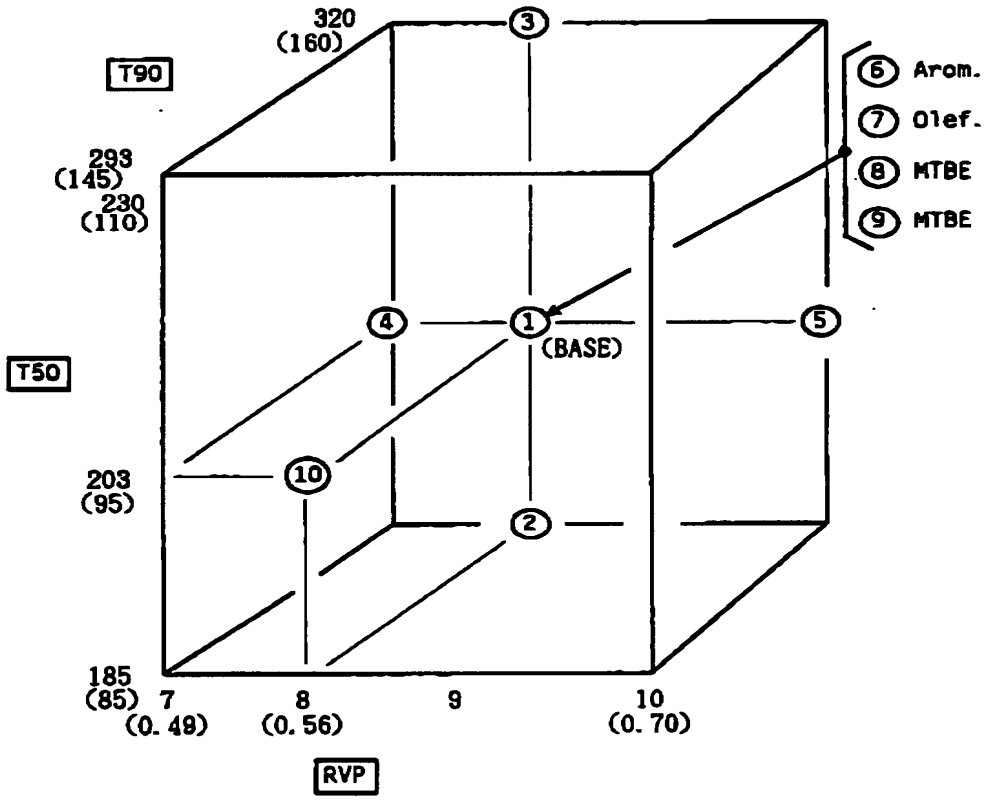
Fuel:	Fuel 1 Table 6	Fuel 2 Table 6	Fuel 6 Table 7
RVP, psi	6.2	7.1	6.7
Aromatics, %	23.1	33.8	46.1
Olefins, %	10.7	12.9	1.0
Paraffins, % (by difference)	66.2	53.3	52.9
Distillation Evaporation			
@ 122° F.	15.0	5.0	
@ 131° F.			4.5
@ 212° F.	56.0	47.0	47.5
@ 302° F.			94.0
@ 356° F.	94.0	90.5	
RON	91	91	91
Oxygenates, %	0	0	0

None of these three fuels has properties falling within the scope of any claim at issue, so that the 44 gasolines of this reference do not suggest any of the gasolines required in the claimed invention.

It is submitted that applicants' invention is manifestly patentable over the Toyota work as reflected in the three references above listed and discussed. The applicants have provided with this IDS No. 11 USPTO Forms 1449 with the documents herewith submitted identified thereon. The applicants request that the Examiner place her initials in the appropriate locations on the form to indicate that she has considered the references submitted with this IDS No. 11.

T_{50} ↑ ≡ emissions ↑

From Toyota
7-17-90

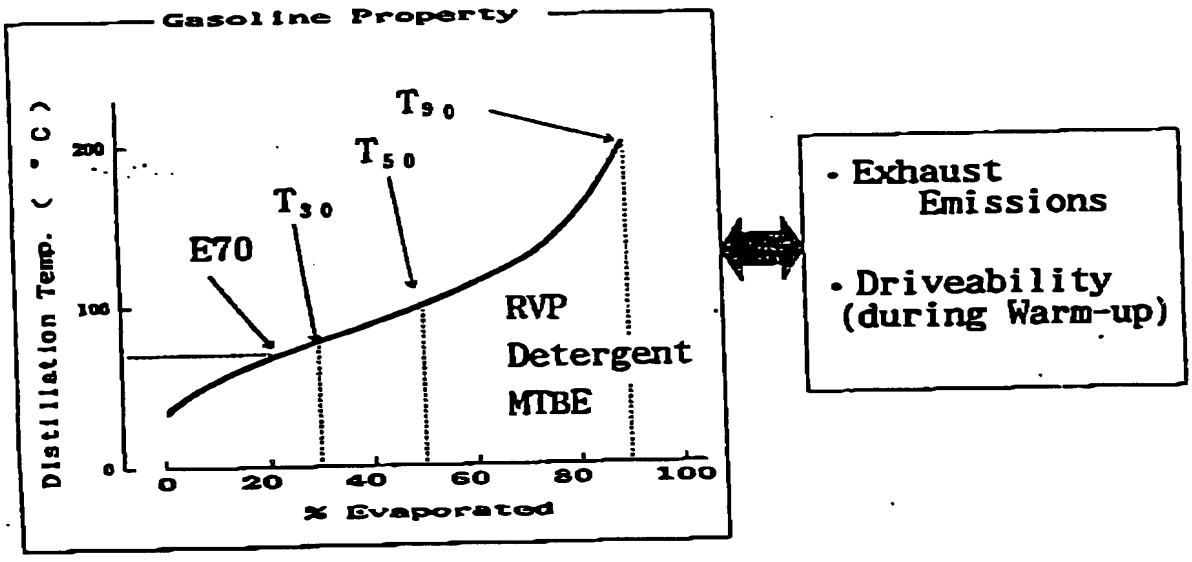


Test Gasoline Matrix

ATTACHMENT T1

EFFECT OF GASOLINE PROPERTY ON EXHAUST EMISSIONS AND DRIVEABILITY

TOYOTA MOTOR CORPORATION
OCTOBER, 1990



1. Driveability Test

* Hesitation during Warm-up Period

• Engine Bench Test

Engine Response Time

• Vehicle Test --- Field Evaluation

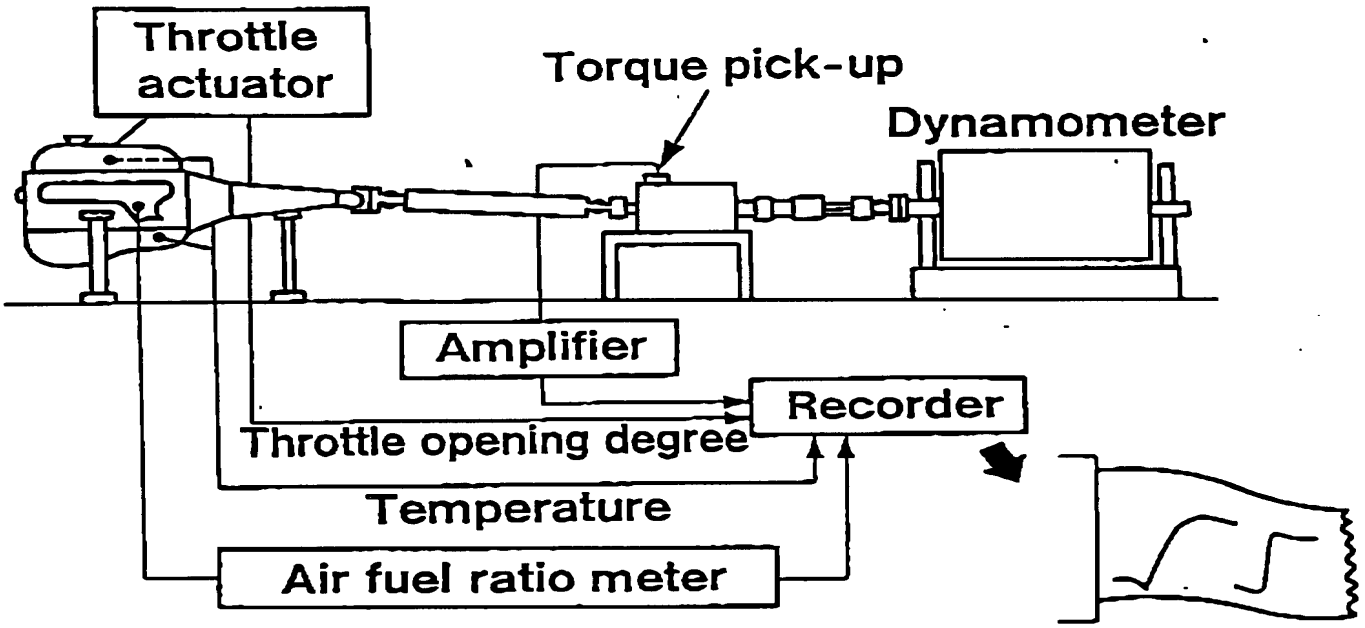
* Engine Startability Test

• Low Temperature Test Cell --- 20° C, -25° C

2. Exhaust Emission Test

Tailpipe Emissions, FTP

Study of the Effect
of
Gasoline Property
on
Engine Response

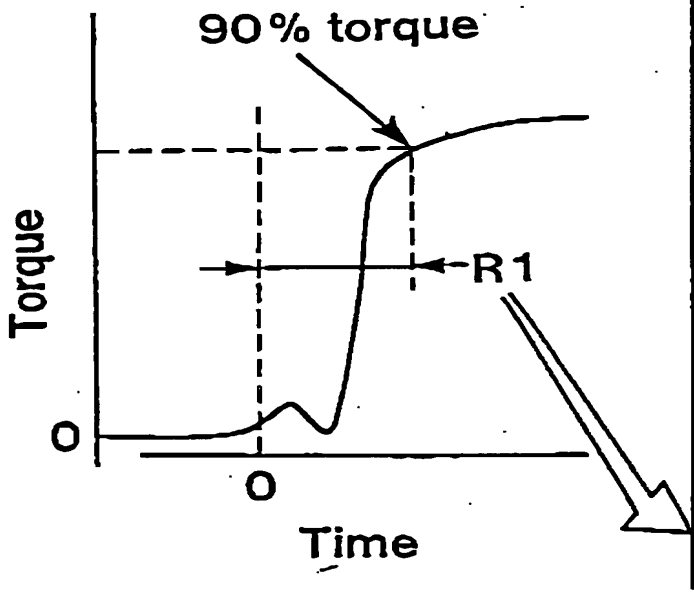


TOYOTA	Experimental apparatus	No. 5

Gasoline No.	1	2	3	----	10	11	12
RVP kPa	71.5	65.7	71.5	----	83.3	84.8	46.0
E70 %	32.3	27.8	32.9	----	33.4	35.7	20.5
T10 °C	48.0	50.5	47.0	----	42.0	41.0	59.5
T50 °C	91.5	99.0	91.0	----	100.0	94.0	110.0
T90 °C	152.0	159.0	152.0	----	162.5	163.0	161.0
Arom. %	28.5	28.0	38.5	----	47.0	38.0	32.8

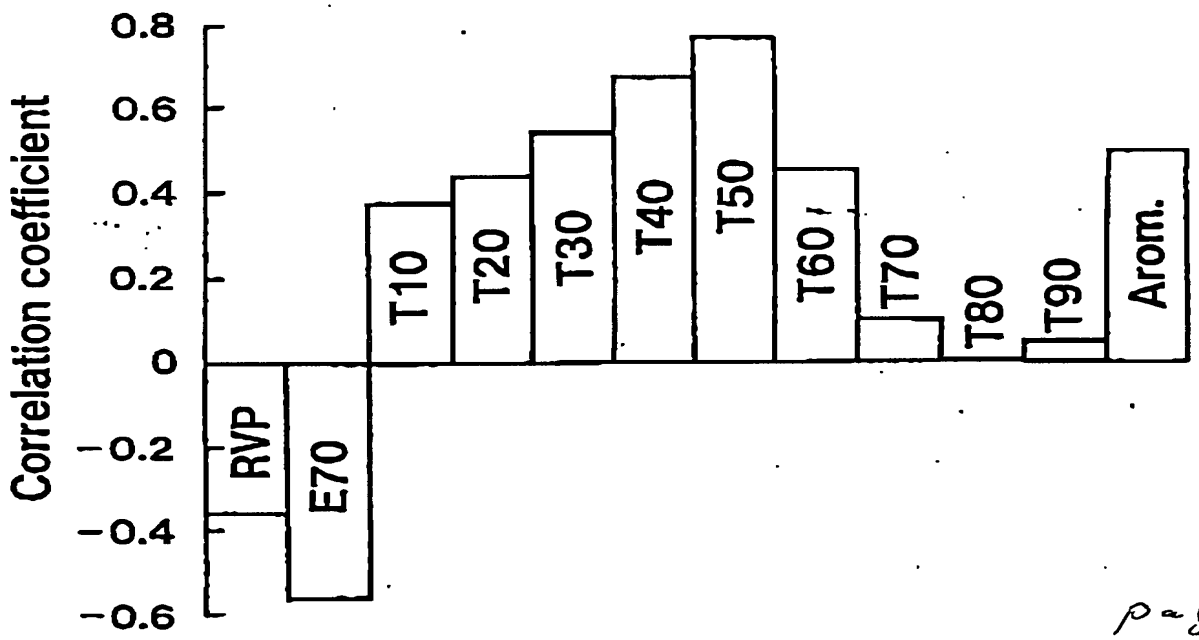
(no oxygenate)

TOYOTA	Test gasolines [Page 3]	No. 8



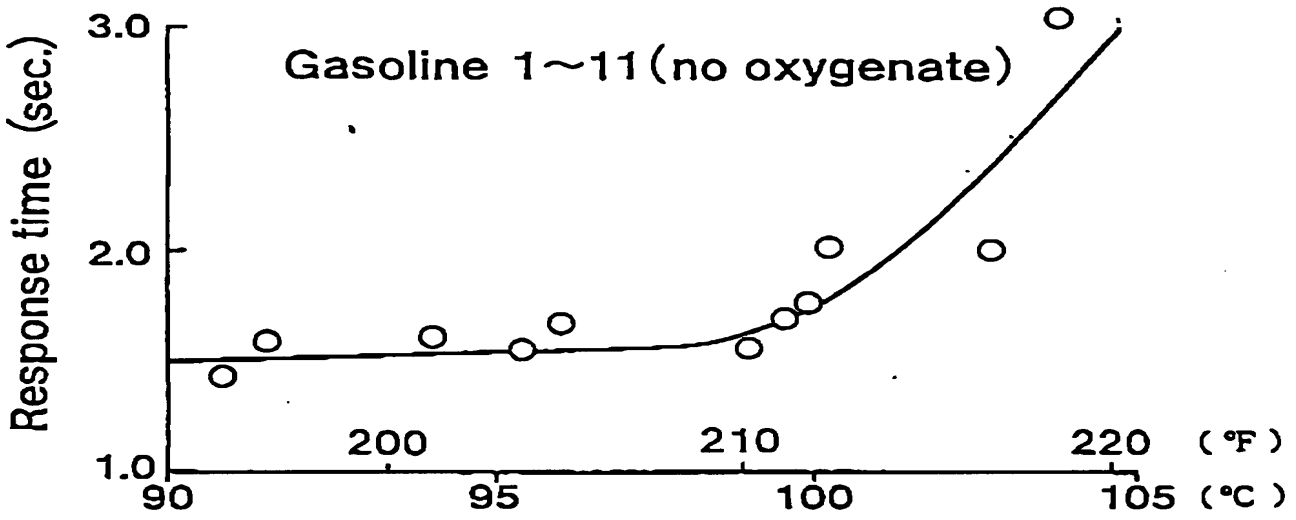
Gasoline	1	2
RVP kPa	71.5	65.7
E 70 %	32.3	27.8
T 10 °C	48.0	50.5
T 50 °C	91.5	99.0
T 90 °C	152.0	159.0
Arom. %	28.5	28.0
Response time (sec.)	R1	R2

TOYOTA | Response time and gasoline characteristics | No. 9

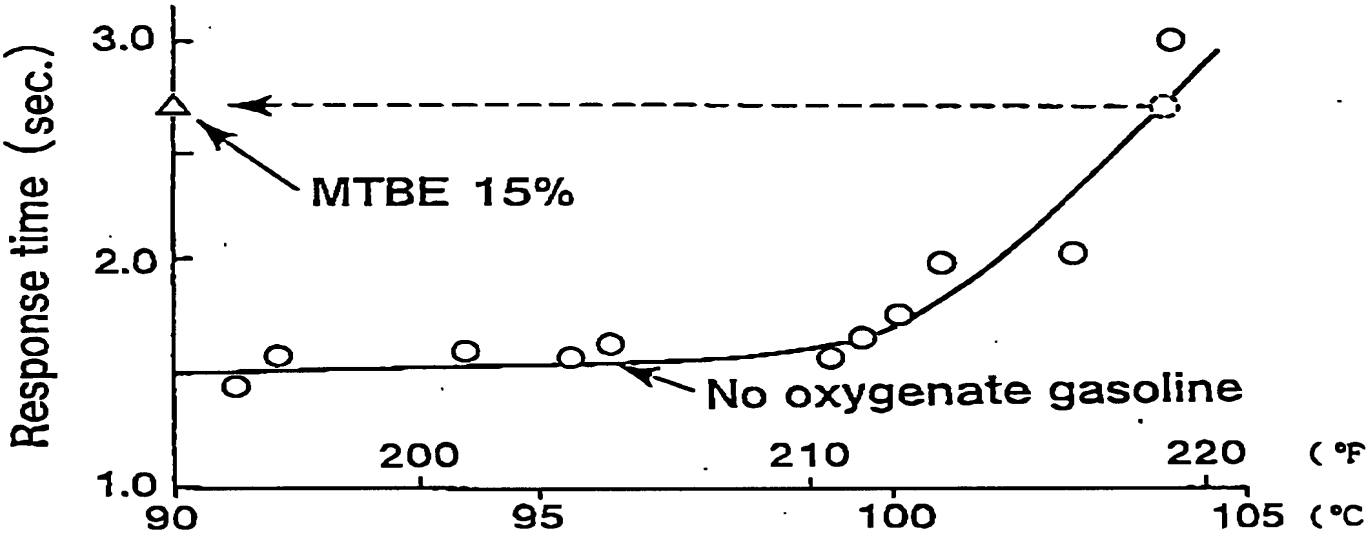


page 4

TOYOTA | Comparison of correlation | No. 10

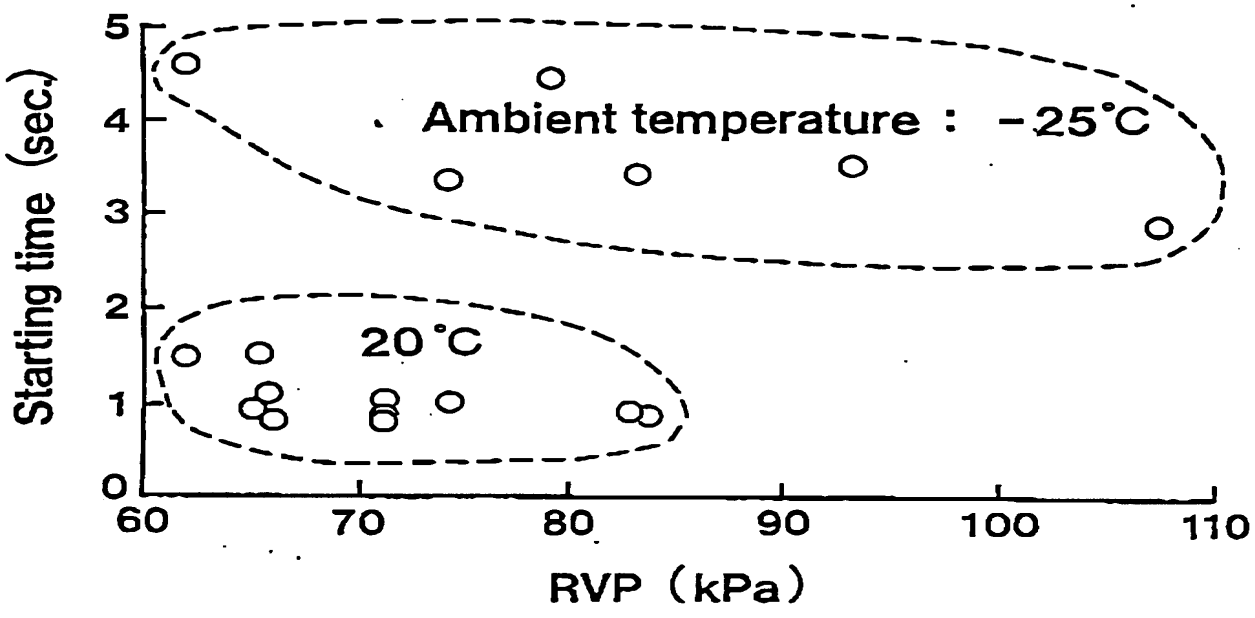


TOYOTA	Effect of 50% distillation temperature	No. 11



page 5

TOYOTA	Effect of MTBE blended gasoline	No. 20

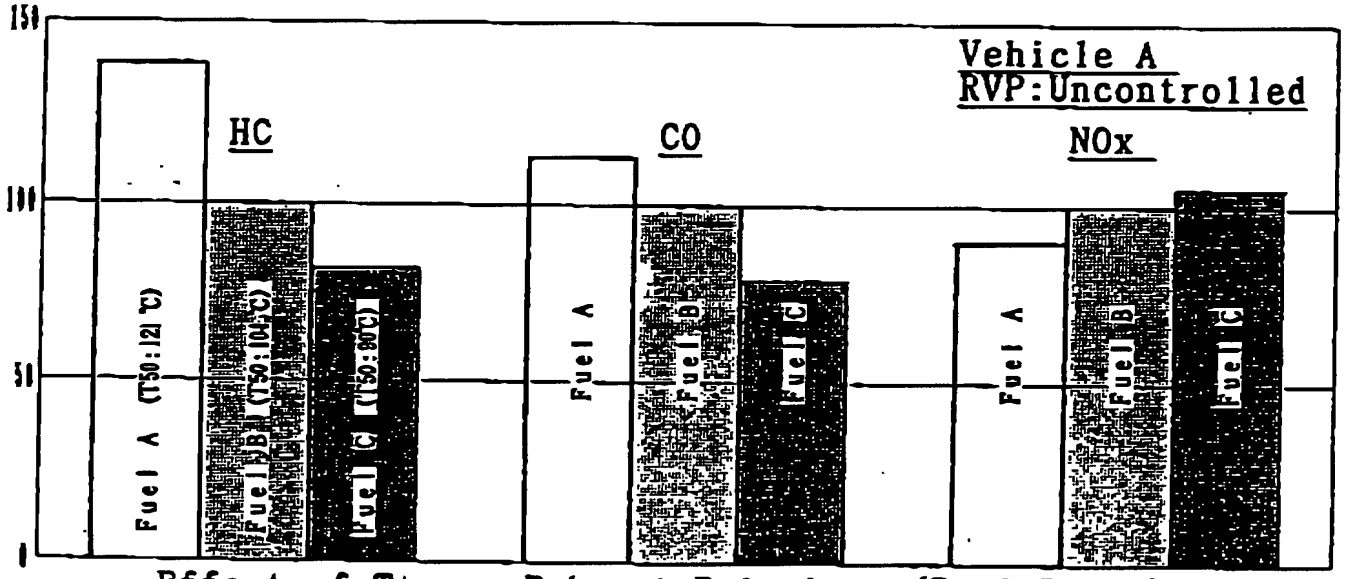


TOYOTA	Effect of RVP on engine start	No. 14

Results of Driveability Test

1. The Middle Range of Gasoline Distillation Temperature Strongly Affects Warm-up Driveability.
   T_{50} Can Be Used as One Indication of Warm-up Driveability.
2. RVP Has a Small Effect on Warm-up Driveability in the Range between 60~90 KPa (8.6~13.0 psi).
3. RVP Regulation Will not Deteriorate Vehicle Driveability, if T_{50} is controlled in a proper range.

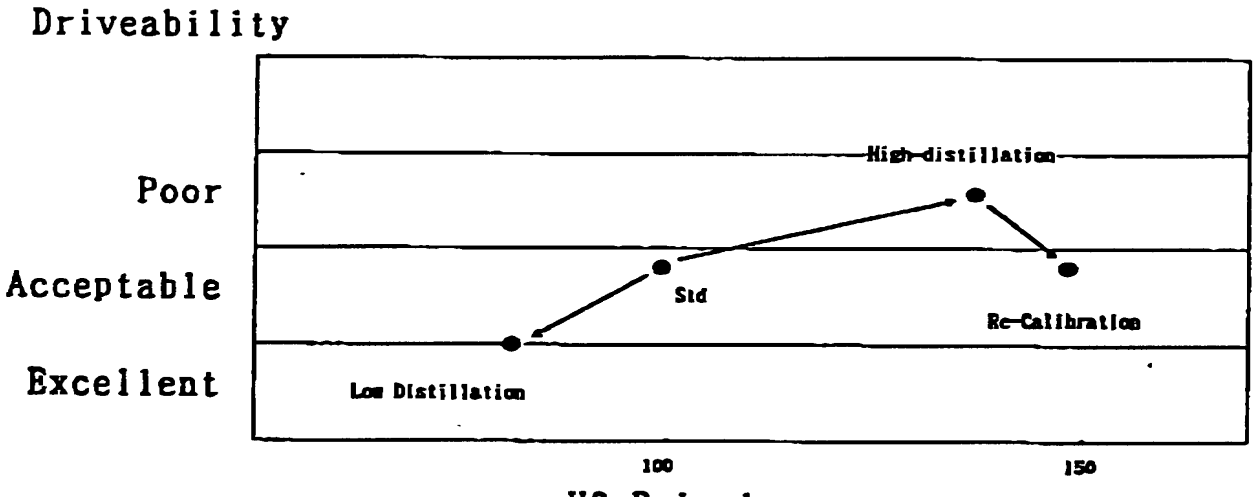
Study of the Effect of Distillation Characteristics on Exhaust Emissions



Effect of T_{50} on Exhaust Emissions (Fuel B=100)

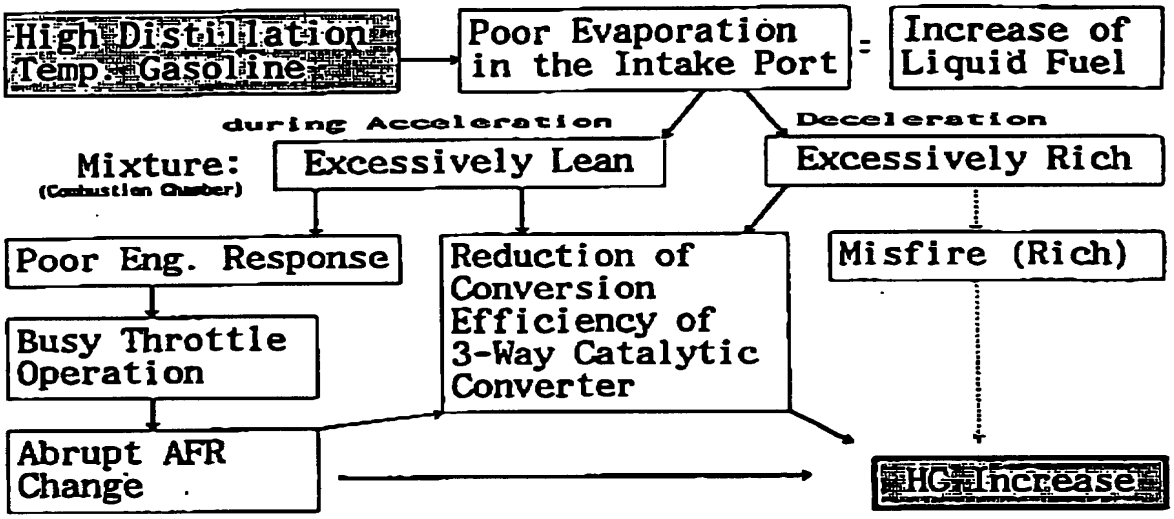
Comparison of Fuel Characteristics(A)

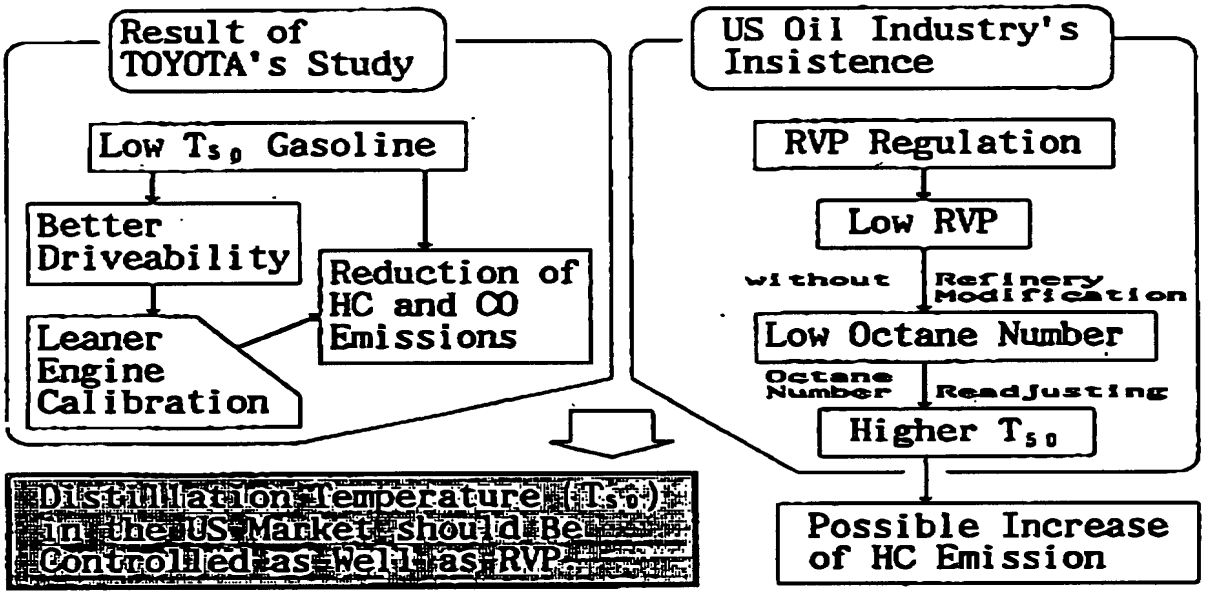
Fuel Characteristics		Fuel A	Fuel B	Fuel C
Density(g/ml@15°C)		0.766	0.743	0.734
RVP (kgf/cm²)		0.55	0.62	0.845
RON		97.2	91.5	91.4
MON		88.4	82.5	82.3
Distillation (°C)	IBP	34.5	31.5	27.5
	10%	58.5	53.0	43.0
	50%	121	104	90.0
	90%	170	157	161
	EP	209	176	176
Aromatics (vol%)		39.3	31.8	30.5
Olefins (vol%)		9.0	5.1	14.5



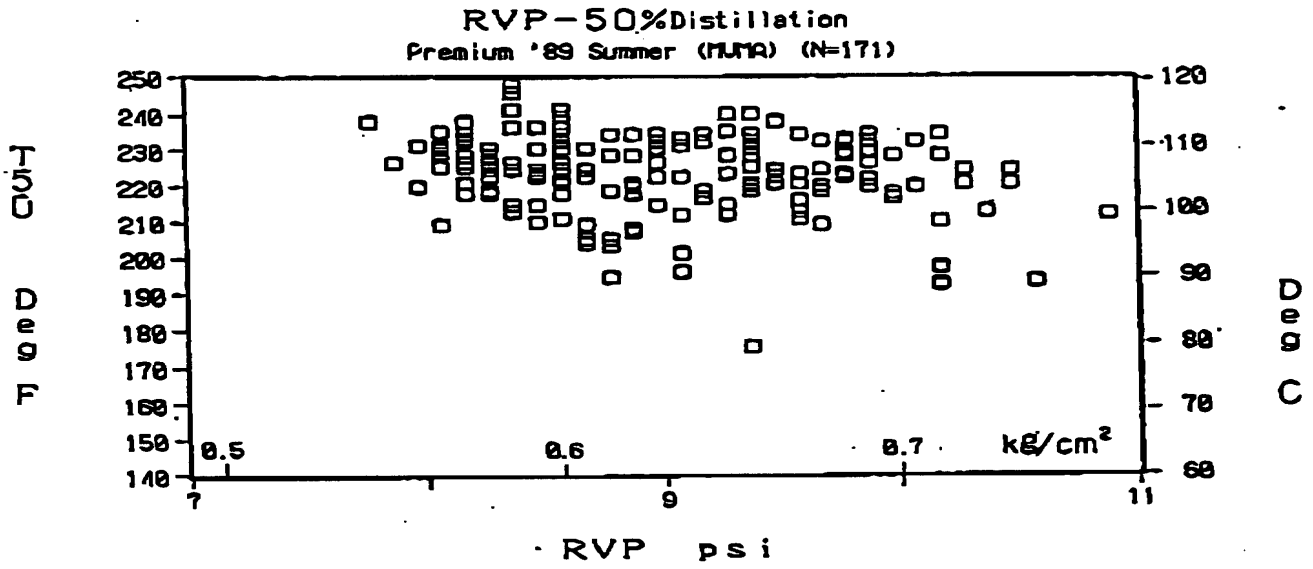
Effect of Gasoline Distillation Characteristics on Exhaust Emmission and Driveability

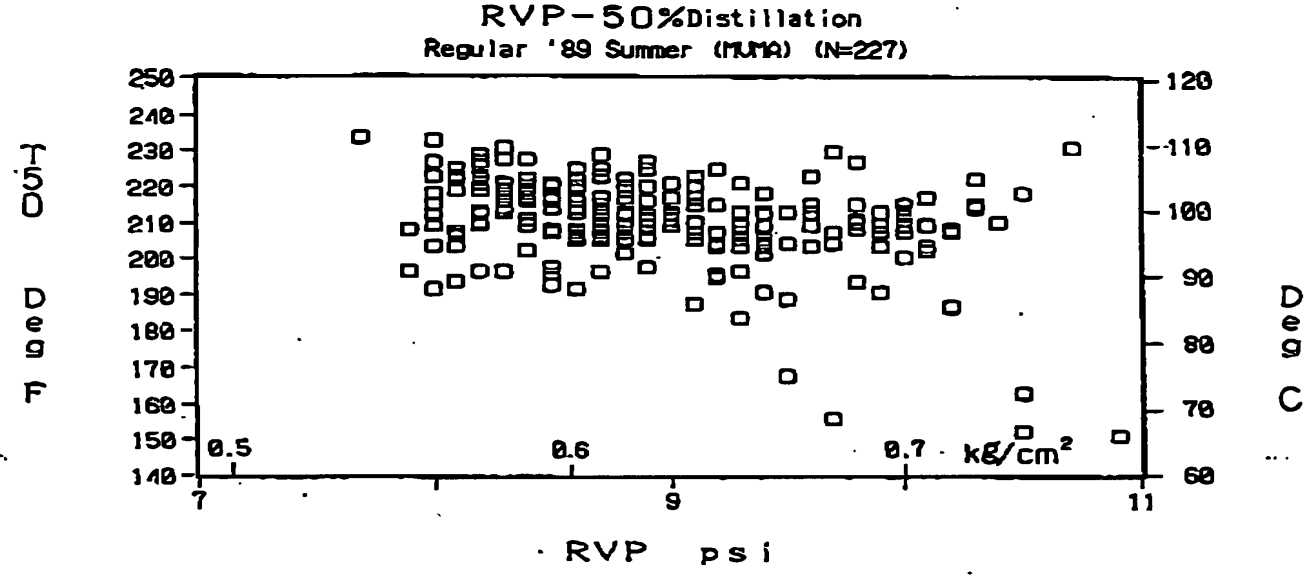
MECHANISM OF HC INCREASE WITH HIGH T_{50} GASOLINE

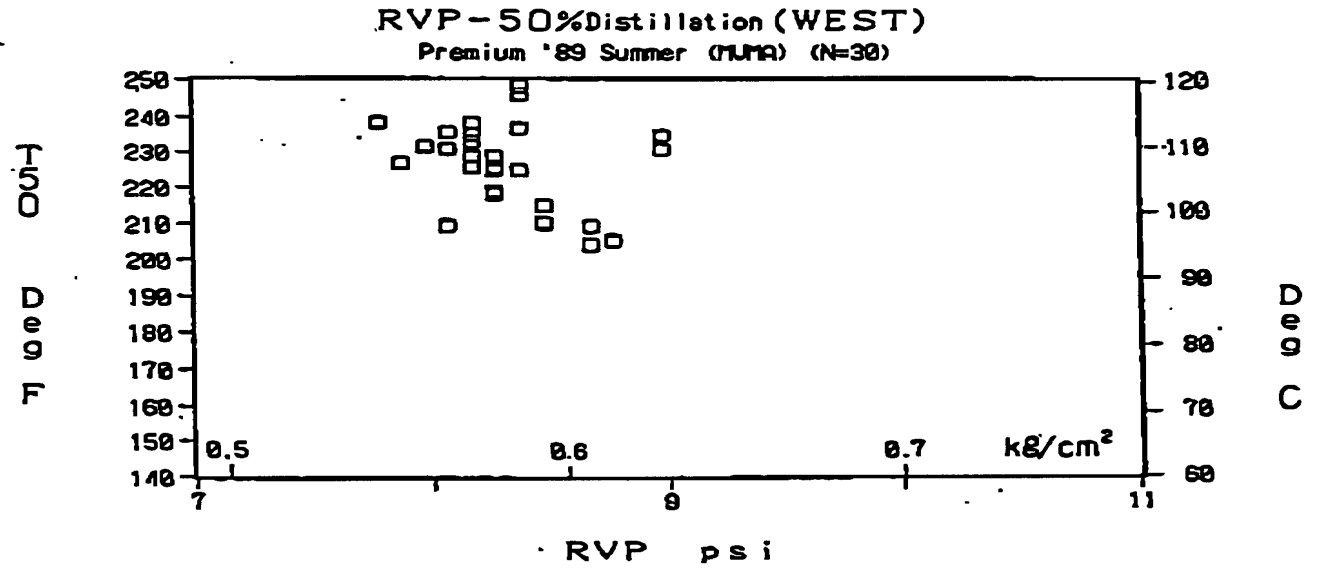


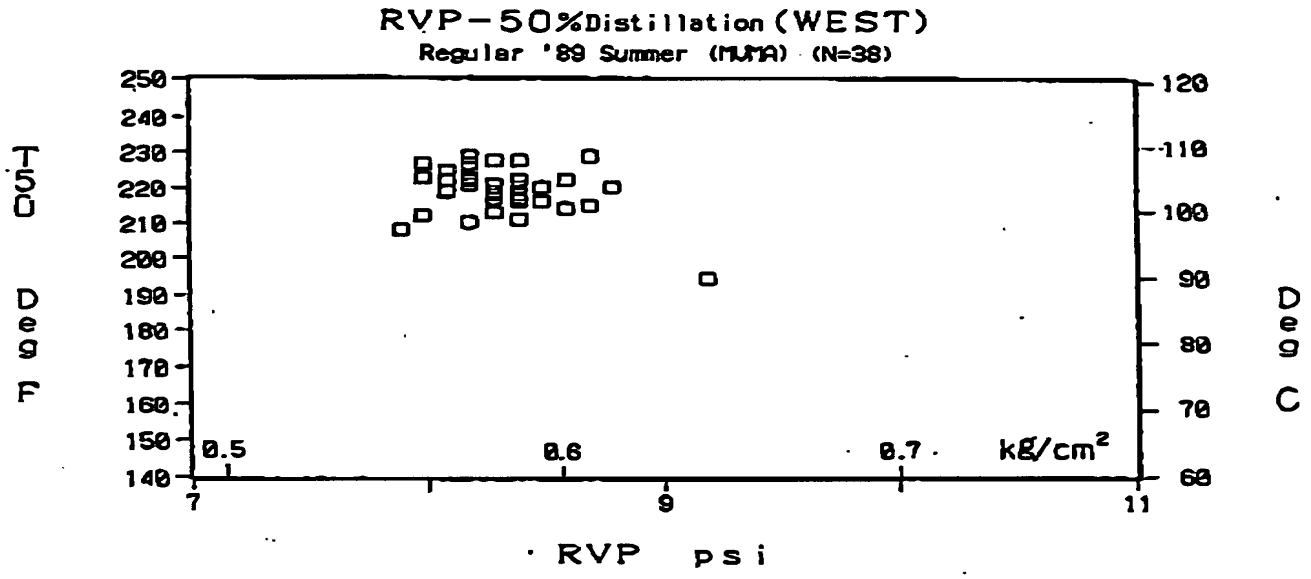


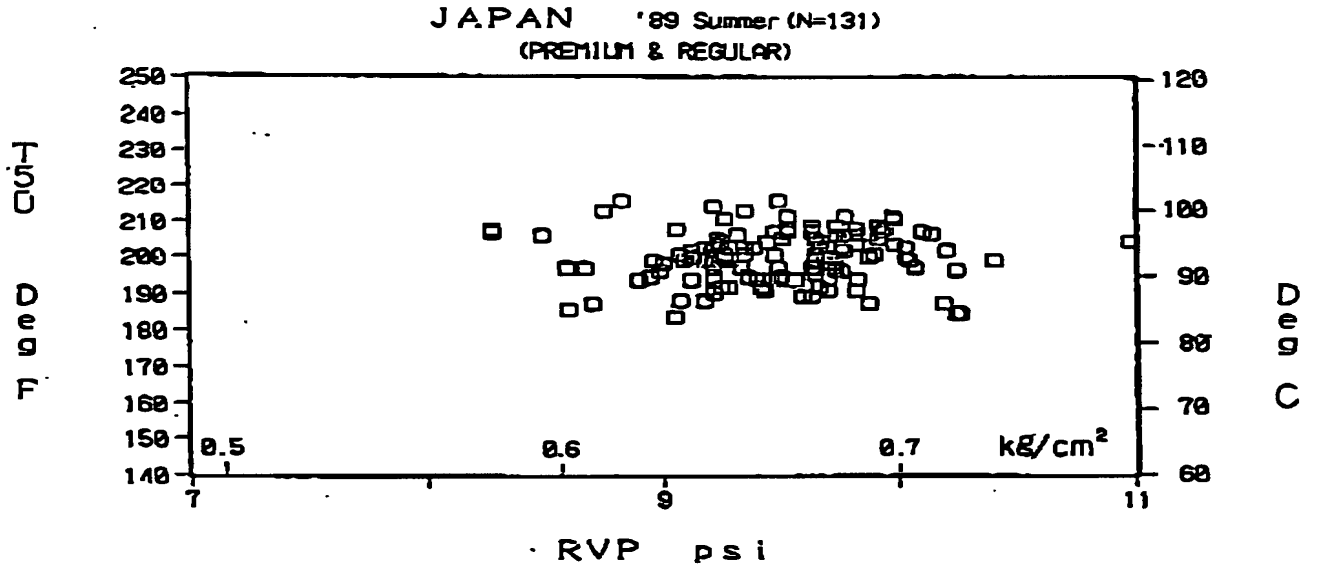
Distribution of Gasoline Characteristics in the US Market




RVP-50%Distillation
Regular '89 Summer (MUMA) (N=227)
T50 Deg F
Deg C
250
240
230
220
210
200
190
180
170
160
150
140
120
110
100
90
80
70
60
0.5
0.6
0.7
kg/cm²
7
9
11
RVP psi

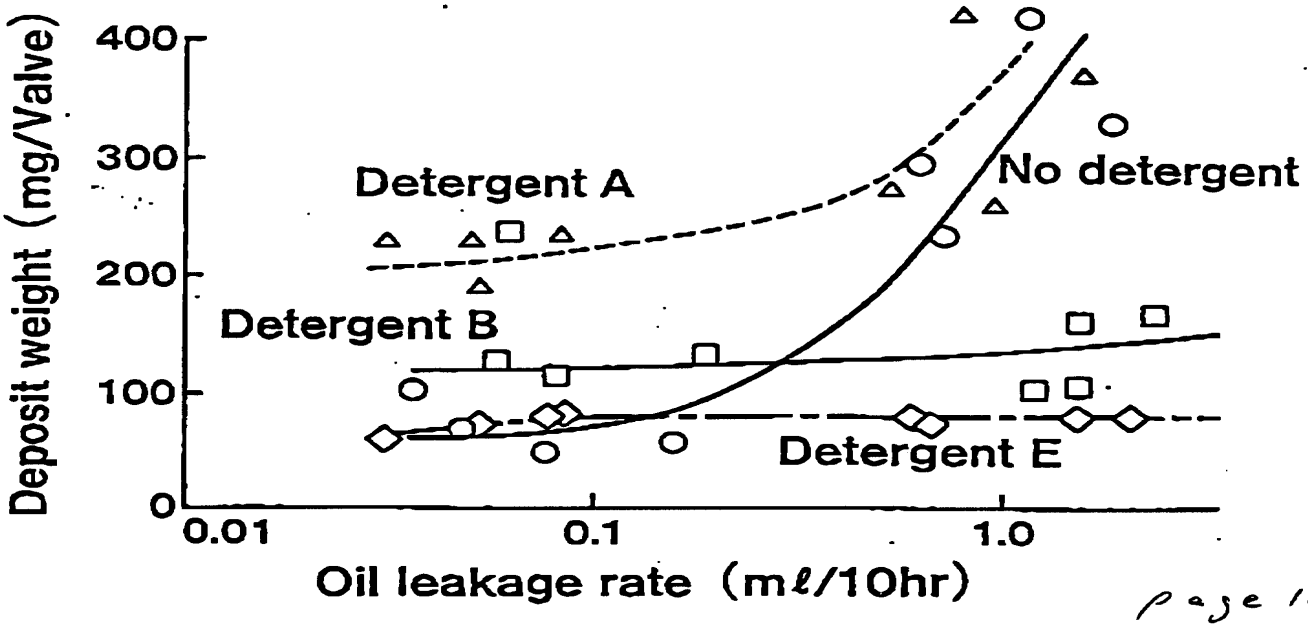

RVP-50%Distillation (WEST)
Premium '89 Summer (MUMA) (N=30)
T50 Deg F
Deg C
250
240
230
220
210
200
190
180
170
160
150
140
120
110
100
90
80
70
60
0.5
0.6
0.7
kg/cm²
7
9
11
RVP psi


RVP-50%Distillation (WEST)
Regular '89 Summer (MUMA) (N=38)
T50 Deg F
250
240
230
220
210
200
190
180
170
160
150
140
120
110
100
90
80
70
60
Deg C
0.5
0.6
0.7
kg/cm²
7
9
11
RVP psi

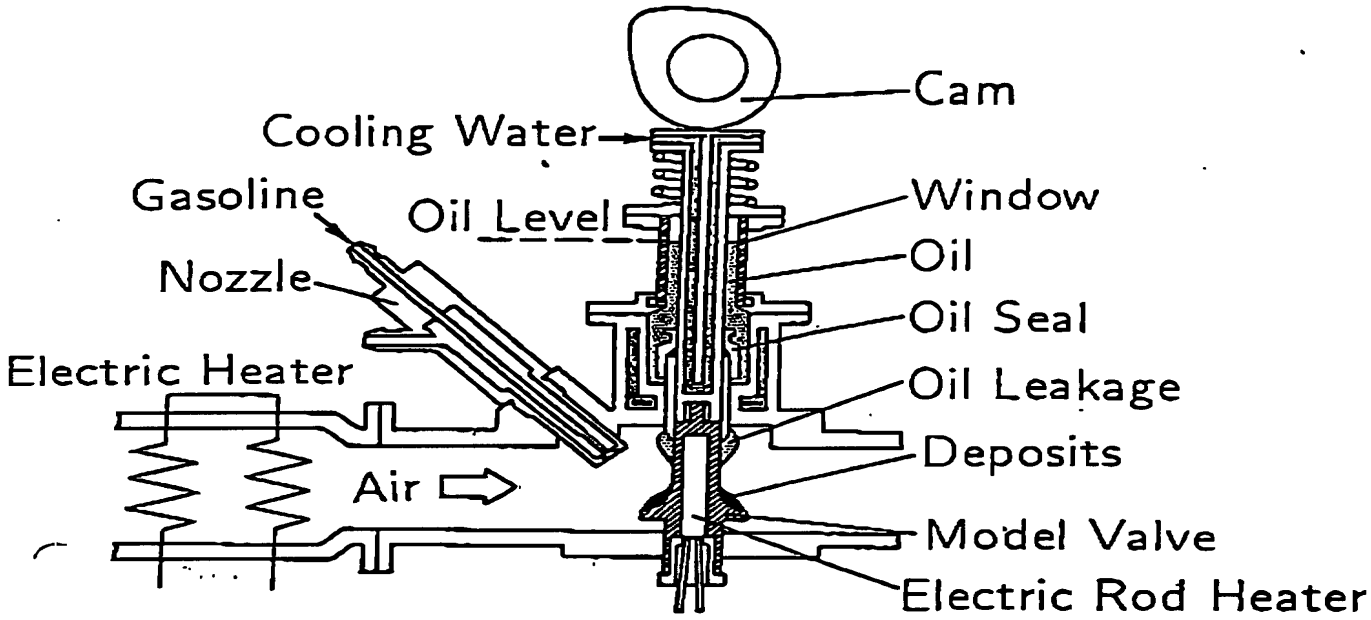

JAPAN '89 Summer (N=131)
(PREMIUM & REGULAR)
T50 Deg F
250
240
230
220
210
200
190
180
170
160
150
140
120
110
100
90
80
70
60
Deg C
0.5
0.6
0.7
kg/cm²
7
9
11
RVP psi

IVD Rating " 6 "		Removal of IVD	IVD Rating "9～10"	
HC	149	→	HC	100
CO	101		CO	100
NO_x	127		NO_x	100

Effect of IVD on Exhaust Emissions



TOYOTA | Effect of gasoline on IVD | No. 31



TOYOTA C. R&D, INC.

Structure of Simulator

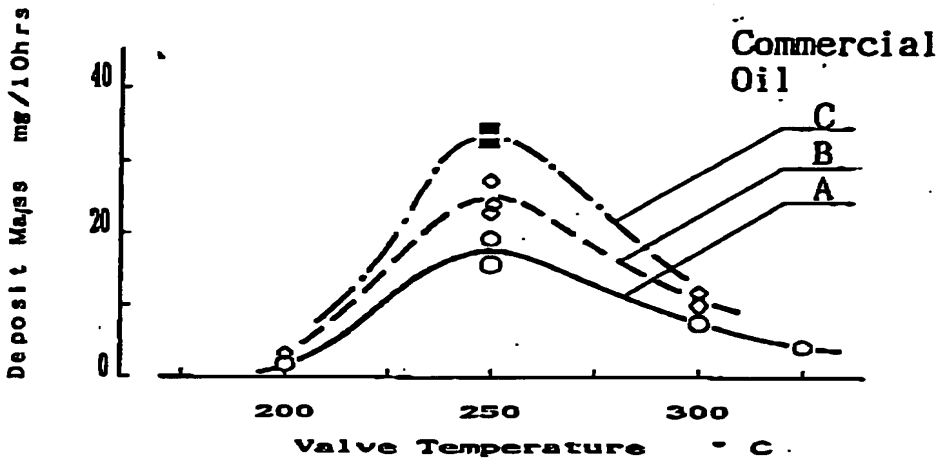
Results of Our Study on the Intake Valve Deposit

(1) IVD Mainly Originates from Engine Oil.

(2) Poor Quality Gasoline Detergents Accelerate Oil Deterioration, and This Increases IVD Formation.

(3) Oil Quality Affects IVD Formation.

(See Next Slide)



Effect of Oil Quality on Intake Valve Deposit

CONCLUSION

(1) The middle Range of Gasoline Distillation Temperature affects Warm-up Driveability, and HC and CO Emissions.

(2) A T_{50} Decrease of 10- 15° C Produces 15-25 % Reduction of HC and CO Emissions.

(3) RVP Regulation may Encourage High T_{50} Gasoline in the US Market and result in Increased HC and CO Emissions, IF the Distillation Temperatures Are Not Controlled.

(4) It Is Hoped the Range of T_{50} Distribution in the US. Will Be Reduced. This Will Contribute to Improved Air Quality.

(5) MTBE-Blended Gasoline Shows Poor Engine Response Characteristics Compared with HC-Type Gasolines.

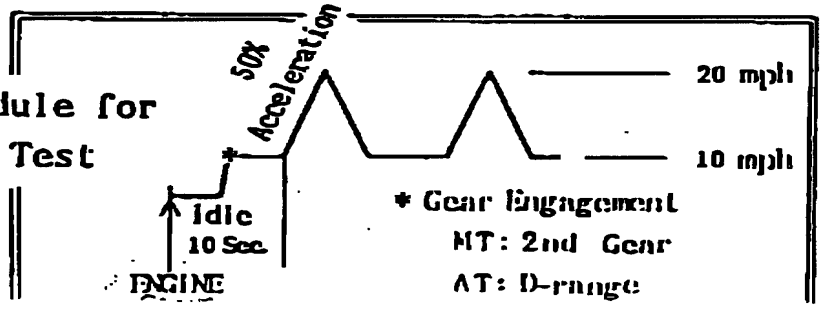
(6) IVD Deteriorates HC and CO Emissions. Engine Oil and Fuel Detergent Quality also Affect IVD.

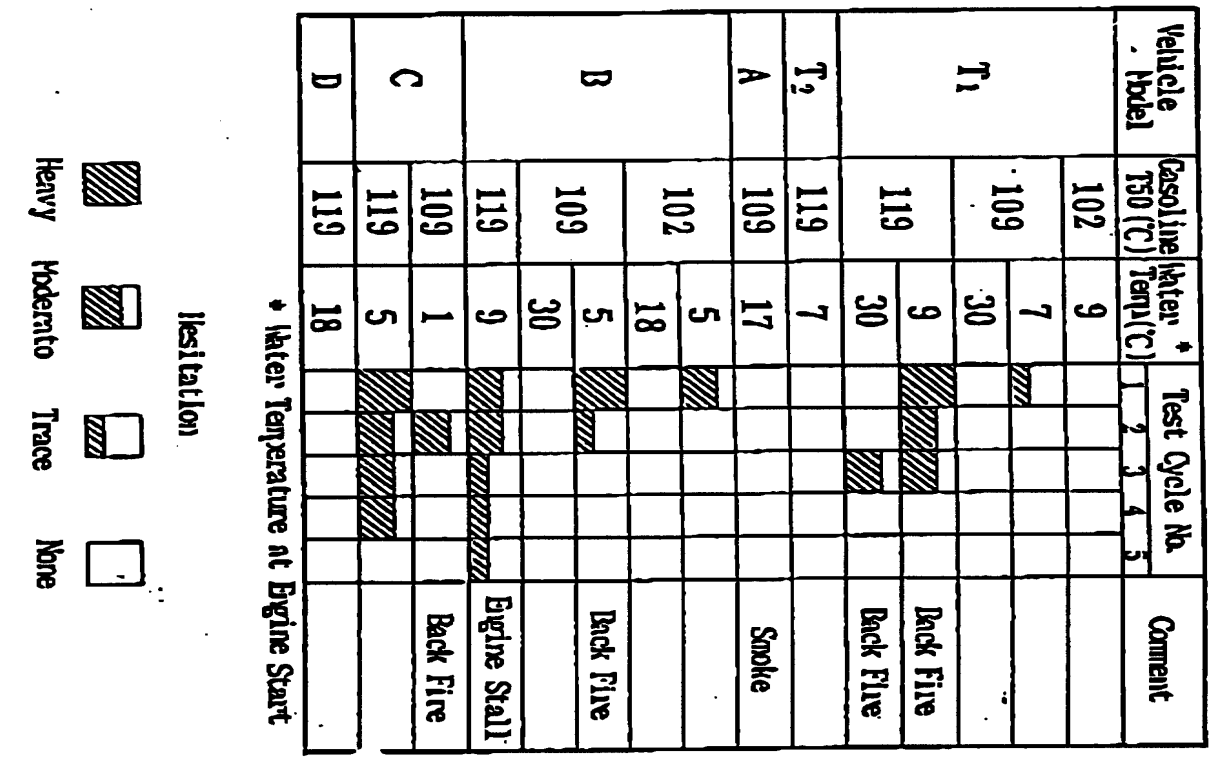
Survey of Driveability of USA Cars

Test Vehicle

Model	Year	Engine	Displacement (l)	Fuel System	Transmission	Mileage
T_1	'87	L4	2.0	FI	MT	1130
T_2	'89	L6	3.0	FI	AT	3440
A	'87	V6	3.8	FI	AT	898
B	'88	L4	2.3	FI	AT	2830
C	'88	L4	2.2	FI	MT	869
D	'88	V6	2.7	FI	MT	3230

Driving Schedule for Driveability Test





Hesitation

Heavy Moderate Trace None

Driveability Test Results

Summary of the Driveability Test

* We believe Customers in the USA Suffer Poor Driveability :
  - Caused by High Distillation Gasoline
  - Deteriorated by IVD Formation during warm-up Period
  - Particularly in the West Coast Area

INFORMATION DISCLOSURE STATEMENT NO. 11

Section B

With respect to the above identified application, the applicants request consideration of the following documents (copies enclosed) relating to the analysis of a racing fuel identified as "Midstates Howell Unleaded":

1. Page AP 9419 of Steve Woods "Research Laboratory Notebook" dated July 12, 1988, attached herewith for permanent record in the file history as **Attachment U1**

2. Document entitled "Gasoline Analysis" dated July 27, 1988 relating to Sample No. AP9419-D, attached herewith for permanent record in the file history as **Attachment U2**

The foregoing documents are internal corporate documents of Unocal relating to the analysis of a sample of a competitor's racing fuel named "Midstates Howell Unleaded" conducted in July, 1988, the sample being identified for reference purposes as Sample No. AP9419-D. **Attachment U1** is a page from the laboratory notebook of Steve Woods, a research technician in Unocal's fuels research group, and **Attachment U2** is a gas chromatography analysis from Unocal's analytical research group of the hydrocarbons in fuel sample AP9419-D. (Note: **Attachment U1** indicates at the bottom that the MTBE analysis is in the "GC Book." Unfortunately, applicants have not been able to locate this MTBE analysis.)

The Examiner is asked to review the data in **Attachments U1 and U2**, particularly in relation to fuels (d) and (e) of claim

181, fuel (d) of claim 195, and fuel (j) of claim 229.

Should the Examiner query the relevance of a racing gasoline to the present invention, applicants would respond that that is a good query. Indeed, applicants' position is that no racing fuel composition per se--whether the fuel is in fact a gasoline or otherwise--is relevant to the claimed invention. Racing fuels, obviously, are specialty products designed for racing cars. Racing gasolines require extremely high octanes, on the order of 100 or so. The racing cars, in turn, are designed with high performance engines needing a high octane fuel. As a result, racing cars rarely have mufflers, and even more rarely have catalytic converters.[3] A muffler and catalytic converter would interfere with the performance of the car (not to mention the fan enjoyment associated with the noise and smoke).

Moreover, one of the last things of concern at a race track is the amount of air pollution engendered during the race. Thus, a mere teaching of a racing gasoline composition, per se, does not provide a suggestion of using such a fuel in a normal everyday automobile with a catalytic converter. And more importantly, there is certainly no suggestion from a racing fuel composition of its utility in reducing automotive tailpipe emissions when used in an automobile with a catalytic converter. Thus, the presently claimed invention is non-obvious over the Midstates Howell Unleaded racing fuel.

Finally, it is emphasized that there is no admission intended herein that the fuels and the analysis set forth in Attachments U1 or U2 are "prior art." Likewise, there is no

---

[3] Applicants' attorney is being kind in suggesting that there might be a race car with a catalytic converter. Actually, applicants are not aware of any races performed with cars having catalytic converters.

admission that the data in such attachments are accurate, and no admission that one or more of the fuels recited in applicants' claims are unpatentable as compositions over the information presented in **Attachments U1 and U2.**

Original to
Technical Information Center

Brea, California

Research Laboratory Record
Union Oil Company of California

AP 9419

Date July 12, 1988 | Project No. 720 65105

Title Competitors Race Gasoline

Received 4, 1-gallon samples of racing Gasoline from competitors for Analysis.

Sample # AP9419-	A	B	C	D
Description	Cam-2 GT Unleaded	Turbo Blue	Midstates Howell 007 Leaded	Midstates Howell Unleaded
RON	105.4	113.2	115.5	105.2
MON	94.3	103.8	106.5	96.3
AKI	99.8	108.5	111.0	100.7
RVP, psi	8.50	5.15	5.25	6.60
D-86 °F EVAP				
IBP	90	116	108	92
5	106	148	132	106
10	132	170	152	116
20	169	195	174	135
30	195	204	194	157
40	208	206	205	181
50	215	210	210	196
60	219	214	212	203
70	222	216	214	212
80	224	219	214	216
90	229	228	218	220
95	237	229	220	222
EP	280	252	438	240
% Rec	97.0	98.5	98.0	99.0
Bottls	1.0	1.0	1.0	1.0
API GRAV @ 60°F	55.1	59.2	64.3	55.1
Pb Content by XRF, g/gal	0.01	4.29	3.91	<0.01

GC Analysis in GC book / MTBE analysis in GC book

Witness _____ Signatures _____

Investigator _____

Attachment U1

GASOLINE ANALYSIS

07/27/88 H.J. BICKFORD

G. REY-MEDINA JUL 27 1988

SAMPLE NO AP9419-D PJJ 581380112 JUL 29 1988

Howell Midstates Unleaded Race Gasoline

	COMPOUND NAME	WT. PCT.	VOL. PCT.	MOL PCT
90	ISOPENTANE	17.24	21.03	22.16
131	N-PENTANE +(TRANS-2-PENTENE)	0.66	0.80	0.85
230	CYCLOPENTANE	0.10	0.11	0.14
250	2-METHYLPENTANE	0.12	0.13	0.12
410	24-DIMETHYLPENTANE	0.67	0.75	0.62
431	223-TRIMETHYLBUTANE +(24-DIMETHYL-1-PENTENE)	0.06	0.06	0.05
550	2-METHYLHEXANE +(5-METHYL-CIS-2-HEXENE)	0.13	0.15	0.12
560	23-DIMETHYLPENTANE +(11-DIMETHYLCYCLOPENTANE) +(34-DIMETHYL-CIS-2-PENTENE)	0.89	0.97	0.83
570	3-METHYLHEXANE	0.10	0.11	0.10
620	224-TRIMETHYLPENTANE +(TRANS-3-HEPTENE)	24.52	26.75	19.91
700	METHYLCYCLOHEXANE +113-TRIMETHYLCYCLOPENTANE	0.04	0.04	0.04
709	25-DIMETHYLHEXANE	0.92	1.00	0.74
710	ETHYLCYCLOPENTANE	0.70	0.69	0.66
720	24-DIMETHYLHEXANE	0.46	0.50	0.38
751	TOLUENE +33-DIMETHYLHEXANE	50.72	44.16	51.02
780	234TRIMETHYLPENTANE	1.08	1.14	0.86
790	233TRIMETHYLPENTANE	0.92	0.96	0.75
810	23-DIMETHYLHEXANE +2-METHYL-3-ETHYLPENTANE +112-TRIMETHYLCYCLOPENTANE	0.14	0.14	0.11
1191	M-XYLENE +(334-TRIMETHYLHEXANE) +(23-DIMETHYLHEPTANE)	0.06	0.05	0.05
	TOTAL PARAFFINS(14 PEAKS)	47.91	54.49	47.61
	TOTAL NAPHTHENES(3 PEAKS)	0.65	0.84	0.84
	TOTAL OLEFINS(0 PEAKS)	0.0	0.0	0.0
	TOTAL AROMATICS(2 PEAKS)	50.78	44.21	51.07
	TOTAL UNIDENTIFIED (29 PEAKS)	0.46	0.46	0.48
		100.00	100.00	100.00

CALCULATED RON IS 105.8 BON IS 102.9

THIS ANALYSIS IS BASED ON A METHOD DESIGNED FOR FINISHED GASOLINES, AND MAY BE INACCURATE OR BIASED WHEN APPLIED TO OTHER MATERIALS; FOR EXAMPLE, OVERLAPPING PEAK IDENTIFICATIONS ARE RESOLVED IN FAVOR OF COMPOUNDS MOST LIKELY TO OCCUR IN GASOLINES.

THE CALCULATED OCTANE NUMBERS (RESEARCH ANOBLENDING) MAY DIFFER FROM DETERMINED VALUES BECAUSE OCTANE CONTRIBUTIONS FROM PURE COMPOUNDS ARE NOT LINEARLY ADDITIVE.

measured RON: 105.2

MON: 96.3

Attachment U2

INFORMATION DISCLOSURE STATEMENT NO. 11

Section C

The applicants desire to inform the Examiner that a continuation application of this application has been filed in the USPTO on June 5, 1995, in major part to preserve applicants' rights in this invention prior to the effect of the GATT treaty on June 8, 1995.

Applicants were recently apprised of the Serial Number of this continuation application, i.e., Serial No. 08/464,554, filed, as stated above, on June 5, 1995. At present, two claims are pending in the '554 continuation application, attached herewith as **Attachment U3.**

CHGLOC 0340
STATUS002

83. A method for operating an automotive vehicle having a spark-induced, internal combustion engine and a catalytic converter to yield a reduced amount of NOx, CO, or unburned hydrocarbons as compared to combusting fuel A/O AVE in said engine, the method comprising:

(1) introducing into the engine an unleaded gasoline, suitable for combustion in an automotive engine, having a Reid Vapor Pressure less than 7.5 psi, an octane value of at least 87, a 10% D-86 distillation point no greater than 158 °F, a 50% D-86 distillation point no greater than 210 °F, and an olefin content less than 10 volume percent;

and thereafter

(2) combusting the unleaded gasoline in said engine;

(3) introducing at least some of the resultant engine exhaust emissions into the catalytic converter; and

(4) discharging emissions from the catalytic converter to the atmosphere.

84. A method for aiding in minimizing air pollution caused at least in part by exhaust emissions from gasoline-powered automobiles equipped with catalytic converters and operating within a geographical area defined by a city and its contiguous area populated by at least 500,000 persons, the geographical area also encompassing a plurality of automotive gasoline service stations,

the operation of said automobiles contributing to air pollution in said geographical area,

the method, performed by a gasoline supplier delivering at least 100,000 gallons per day of unleaded gasoline as defined below for automotive combustion in the geographical area during a one week time period, comprising:

delivering to at least 25% of the automotive gasoline service stations supplied by said supplier in said geographical area during said one week time period unleaded gasoline yielding, upon combustion, a reduced amount of NOx, CO, and unburned hydrocarbons as compared to Fuel A/O AVE, said unleaded gasoline being suitable for combustion in an automotive engine and having a Reid Vapor Pressure less than 7.5 psi, an octane value of at least 87, a 10% D-86 distillation point no greater than 158 °F, a 50% D-86 distillation point no greater than 210 °F, and an olefin content less than 10 volume percent.

Large Volume Ind. Claim	Combustion Ind. Claim	RVP	T_{10}	T_{50}	T_{90}	Olefin	Paraffin	Octane	Oxygenate Required
117(a)	142(a)	<7		≤210			>72	≥87	No
117(b)	142(b)	<7		≤210			>65	≥92	No
117(c)	142(c)	<7		<193		<10		≥87	No
117(d)	142(d)	<7		≤210		< 1		≥87	No
154(d)	142(h)	<7	≤158	≤215		<10		≥87	Yes up to 14.9% MTBE
117(e)	91	<7		≤210	<300	<10		≥87	No
	96	<7	≤158	≤210	<300	<10		≥87	No
154(a)	142(e)	<7.5	≤158	≤215	≤315	<10	>65	≥87	Yes
154(b)	142(f)	<7	≤158	≤215			>65	≥87	Yes
154(c)	142(g)	<7	≤158				>70	≥87	Yes

91. [redacted] A method for operating an automotive vehicle that [redacted] aids in minimizing the amount of at least one gaseous pollutant selected from the group consisting of NOx, CO, and hydrocarbons in the exhaust emissions discharged into the atmosphere, the automotive vehicle having a spark-induced, internal combustion engine and a catalytic converter, the method comprising:

[redacted] (1) introducing into the engine an unleaded gasoline having

(a) a Reid Vapor Pressure less than 7.0 psi,

(b) a 50% D-86 distillation point no greater than 210° F.,

(c) an olefin content less than [redacted] 10 vol.%,

(d) a 90% D-86 distillation point less than 300° F., and

(e) an octane value of at least 87;

and thereafter

(2) combusting the unleaded gasoline in said engine;

(3) [redacted] contacting at least some of the resultant engine exhaust emissions with the catalytic converter; and

(4) [redacted] discharging the exhaust emissions from the catalytic converter to the atmosphere.

92. [redacted] A method as defined in claim 91 wherein the unleaded gasoline has an olefin content less than [redacted] 8 volume percent.

94. [redacted] A method as defined in claim 91 [redacted] wherein the gasoline has a Reid Vapor Pressure no greater than 6.8 psi and a maximum D-86 10% Distillation Point of 140° F.

95. A method as defined in claim 94 wherein the Reid Vapor Pressure of the unleaded gasoline is no greater than 6.5 psi.

96. [redacted] A method for reducing the amount of at least one gaseous pollutant emitted in automotive exhaust emissions, comprising:

[redacted] (1) introducing into a spark-induced automotive internal combustion engine in an automotive vehicle equipped with a catalytic converter for treating exhaust emissions, an unleaded gasoline having

(a) a Reid Vapor Pressure less than 7.0 psi,

(b) a 50% D-86 distillation point no greater than 210° F.,

(c) an olefin content less than 10 vol.%,

(d) a 90% D-86 distillation point less than 300° F.,

(e) an octane value of at least 87; and

(f) a 10% D-86 distillation point no greater than 158° F.; and

[redacted] (2) combusting the gasoline in said engine to yield exhaust emissions, which, after treatment in the catalytic converter, have, in comparison to combusting according to the Federal Test Procedure a fuel having the properties for blend A/O AVE shown in TABLE 2, a reduced amount of at least one gaseous pollutant selected from the group consisting of NO_x, CO, and unburned hydrocarbons.

98. [redacted] A method as defined in claim 91 [redacted] wherein the unleaded gasoline has [redacted] a D-86 10% Distillation point no greater than [redacted] 140° F. [redacted]

99. [redacted] A method as defined in claim 91 wherein the unleaded gasoline has [redacted] an olefin content less than [redacted] 6 volume percent.

100. [redacted] The method [redacted] of claim 91, 94, 96 or 99 in which the unleaded gasoline being combusted in said engine contains one or more added oxygenates and meets all the requirements of at least

one of the Class A, Class B, Class C, Class D, and Class E gasolines set forth in TABLE 1.

101. The method of claim 100 resulting in the reduction of NO_x emitted in the exhaust emissions from said catalytic converter.

102. The method of claim 100 resulting in the reduction of unburned hydrocarbons emitted in the exhaust emissions from said catalytic converter.

103. The method of claim 100 resulting in the reduction of CO emitted in the exhaust emissions from said catalytic converter.

104. The method of claim 100 wherein said catalytic converter is a three-way catalytic converter, and the total measured amount of NO_x, CO, and hydrocarbons emitted from said converter is reduced by at least 10% in comparison to fuel A/O AVE in Table 2 when combusted in the same engine under the same conditions as said unleaded gasoline according to the Federal Test Procedure.

105. [redacted] The method of claim 100 wherein said unleaded gasoline contains one or more oxygenates in a total oxygen concentration between the equivalent of about 10.1 and [redacted] 14.9 vol.% methyl tertiary butyl ether.

106. [redacted]

[redacted] The method of claim 105 wherein said unleaded gasoline contains greater than 65 volume percent paraffins.

107. [redacted] The method of claim [redacted] 105 wherein said unleaded gasoline contains greater than 72 volume percent paraffins.

108. [redacted] The method of claim [redacted] 100 wherein said unleaded gasoline contains greater than 65 volume percent paraffins.

117. [redacted] A method of aiding in [redacted] minimizing air pollution caused by [redacted] automobiles comprising the steps of:

(1) producing in an oil refinery a substantial amount of [redacted] unleaded gasoline selected from the group consisting of:

(a) unleaded gasolines having a Reid Vapor Pressure less than 7.0 psi, an octane value of at least 87, a 50% D-86 distillation point no greater than 210 °F, and a paraffin content greater than 72 volume percent;

(b) unleaded gasolines having a Reid Vapor Pressure less than 7.0 psi, an octane value of at least 92, a 50% D-86 distillation point no greater than 210 °F, and a paraffin content greater than 65 volume percent;

(c) unleaded gasolines having a Reid Vapor Pressure less than 7.0 psi, an octane value of at least 87, a 50% D-86 distillation point less than 193 °F, and an olefin content less than 10 volume percent;

(d) unleaded gasolines having a Reid Vapor Pressure less than 7.0 psi, an octane value of at least 87, a 50% D-86 distillation point no greater than 210 °F, and an olefin content less than 1 volume percent; and

(e) unleaded gasolines having a Reid Vapor Pressure less than 7.0 psi, an octane value of at least 87, a 50% D-86 distillation point no greater than 210 °F, an olefin content less than 10 volume percent, and a 90% D-86 distillation point less than 300 °F. [redacted];

(2) delivering said unleaded gasoline to a substantial number of gasoline service stations distributed within a geographical [redacted] region with significant air pollution caused in substantial part by the emission of exhaust gases from the operation of automobiles within said region; and

(3) dispensing the unleaded gasoline from said gasoline service stations into a substantial number of automobiles for subsequent combustion therein, said automobiles having catalytic converters for treating exhaust emissions.

118. The method of claim 117 performed during a time period of one month wherein the amount of said unleaded gasoline dispensed in step (3) during said month is the equivalent of at least 100,000 gallons of gasoline per day.

119. The method of claim 117 performed during a time period of one week wherein the amount of said unleaded gasoline dispensed in step (3) during said week is at least 10,000,000 gallons of gasoline.

120. The method of claim 117 wherein the amount of said unleaded gasoline dispensed in step (3) over the course of one month is equivalent to at least 25% of the amount dispensed by all service stations in said region for said month.

121. The method of claim 117, 118, 119, or 120 wherein said gasoline produced in step (1) is gasoline (a).

122. The method of claim 121 wherein the gasoline produced in step (1) has an olefin content less than 10 volume percent and a 90% D-86 distillation point no greater than 315 °F.

123. The method of claim 122 wherein the gasoline produced in step (1) has an olefin content less than 6 volume percent.

124. The method of claim 122 wherein the gasoline produced in step (1) has a 50% D-86 distillation point less than 200 °F.

125. The method of claim 117, 118, 119, or 120 wherein said gasoline produced in step (1) is gasoline (b).

126. The method of claim 125 wherein the gasoline produced in step (1) has an olefin content less than 6 volume percent and a 90% D-86 distillation point no greater than 315 °F.

127. The method of claim 126 wherein the gasoline produced in step (1) has a 50% D-86 distillation point less than 200 °F.

128. [redacted] The method of claim 117 [redacted] or 119 [redacted] wherein said gasoline produced in step (1) is gasoline (c).

129. The method of claim 128 wherein the gasoline produced in step (1) has an olefin content less than 6 volume percent and a 90% D-86 distillation point no greater than 315 °F.

130. The method of claim 129 wherein the gasoline produced in step (1) has a paraffin content greater than 65 volume percent.

131. [redacted] The method of claim 117 [redacted] wherein said gasoline produced in step (1) is gasoline (d).

132. The method of claim 131 wherein said gasoline (d) has a paraffin content greater than 65 volume percent and a 90% D-86 distillation point less than 300 °F.

133. The method of claim 117, 118, 119, or 120 wherein said gasoline produced in step (1) is gasoline (e).

134. [redacted] The method of claim 133 wherein said unleaded gasoline produced in step (1) contains one or more oxygenates in a total oxygen concentration between the equivalent of about 10.1 and [redacted] 14.9 vol.% methyl tertiary butyl ether.

135. [redacted] The method of claim [redacted] 134 wherein the gasoline produced in step (1) has a paraffin content greater than 65 volume percent.

136. [redacted] The method of claim [redacted] 134 wherein said unleaded gasoline produced in step (1) contains less than 8 volume percent olefins [redacted].

137. [redacted] The method of claim 136 wherein said unleaded gasoline produced in step (1) contains less than 6 volume percent olefins but more than 72 volume percent paraffins.

138. [redacted] The method of claim [redacted] 117, 118, 119, or 120 wherein said unleaded gasoline produced in step (1) contains [redacted] one or more added oxygenates.

139. [redacted] The method of claim [redacted] 117, 118, 119, or 120 wherein [redacted] said unleaded gasoline produced in step (1) [redacted] contains one or more oxygenates in a total oxygen concentration between the equivalent of about 10.1 and 14.9 vol.% methyl tertiary butyl ether.

142. [redacted]) A method for [redacted] aiding in minimizing the amount of at least one gaseous pollutant selected from the group consisting of NOx, CO, and hydrocarbons emitted in automotive exhaust emissions, comprising:

(1) introducing, into a spark-induced automotive internal combustion engine in an automotive vehicle equipped with a catalytic converter for treating exhaust emissions, an unleaded gasoline selected from the group consisting of:

(a) unleaded gasolines having a Reid Vapor Pressure less than 7.0 psi, an octane value of at least 87, a 50% D-86 distillation point no greater than 210 °F, and a paraffin content greater than 72 volume percent;

(b) unleaded gasolines having a Reid Vapor Pressure less than 7.0 psi, an octane value of at least 92, a 50% D-86 distillation point no greater than 210 °F, and a paraffin content greater than 65 volume percent;

(c) unleaded gasolines having a Reid Vapor Pressure less than 7.0 psi, an octane value of at least 87, a 50% D-86 distillation point less than 193 °F, and an olefin content less than 10 volume percent;

(d) unleaded gasolines having a Reid Vapor Pressure less than 7.0 psi, an octane value of at least 87, a 50% D-86 distillation point no greater than 210 °F, and an olefin content less than 1 volume percent; [redacted]

(e) unleaded, oxygenated gasolines having a Reid Vapor Pressure less than [redacted] 7.5 psi, an octane value of at least 87, a 10% D-86 distillation point no greater than 158 °F, a 50% D-86 distillation point no greater than [redacted] 215 °F, a 90% D-86 distillation point no greater than 315 °F., a paraffin content greater than 65 volume percent, and an olefin content less than 10 volume percent [redacted];

(f) unleaded, oxygenated gasolines of octane value at least 87 with a Reid Vapor Pressure less than 7.0 psi, a 10% D-86 distillation point no greater than 158° F., a paraffin content greater than 65 volume percent, and a 50% D-86 distillation point

no greater than 215 °F.;

(g) unleaded, oxygenated gasolines of octane value at least 87 with a Reid Vapor Pressure less than 7.0 psi, a 10% D-86 distillation point no greater than 158° F., and a paraffin content greater than 70 volume percent; and

(h) unleaded, oxygenated gasolines of octane value at least 87 with a Reid Vapor Pressure less than 7.0 psi, a 10% D-86 distillation point no greater than 158° F., a 50% D-86 distillation point no greater than 215 °F, an olefin content less than 10 volume percent, and the oxygenates are present in a total oxygen concentration no greater than the equivalent provided by about 14.9 volume percent methyl tertiary butyl ether;

(2) combusting the gasoline in said engine, and

(3) passing emissions from said engine through the catalytic converter to be treated therein.

143. The method of claim 142 wherein the gasoline introduced into said engine is unleaded gasoline (a).

144. The method of claim 142 wherein the gasoline introduced into said engine is unleaded gasoline (b).

145. The method of claim 142 wherein the gasoline introduced into said engine is unleaded gasoline (c).

146. The method of claim 142 wherein the gasoline introduced into said engine is unleaded gasoline (d).

147. The method of claim 142 wherein the gasoline introduced into said engine is unleaded gasoline (e).

148. [redacted] The method of claim 147 wherein said unleaded gasoline [redacted] has a 90% D-86 distillation point no greater than 300° F.

149. [redacted] The method of claim 143 or 144 [redacted] wherein said unleaded gasoline contains less than 6 volume percent olefins and the 90% D-86 distillation point is no greater than 315°F.

150. [redacted] The method of claim [redacted] 147 wherein said unleaded gasoline contains one or more oxygenates in a total oxygen concentration between the equivalent of about 10.1 and 14.9 vol.% methyl tertiary butyl ether.

151. The method of claim 150 wherein the unleaded gasoline contains greater than 72 volume percent paraffins.

152. The method of claim 150 wherein the Reid Vapor Pressure is less than 7.0 psi.

153. The method of claim 152 wherein the unleaded gasoline contains greater than 72 volume percent paraffins.

154. A method of aiding in minimizing air pollution caused by automobiles comprising the steps of:

(1) producing in an oil refinery a substantial amount of unleaded, oxygenated gasoline selected from the group consisting of

(a) unleaded, oxygenated gasolines of octane value at least 87 with a Reid Vapor Pressure less than 7.5 psi, a 10% D-86 distillation point no greater than 158° F., a 50% D-86 distillation point no greater than 215 °F., a 90% D-86 distillation point no greater than 315 °F., a paraffin content greater than 65 volume percent, and an olefin content less than 10 volume percent;

(b) unleaded, oxygenated gasolines of octane value at least 87 with a Reid Vapor Pressure less than 7.0 psi, a 10% D-86 distillation point no greater than 158° F., a paraffin content greater than 65 volume percent, and a 50% D-86 distillation point no greater than 215 °F.;

(c) unleaded, oxygenated gasolines of octane value at least 87 with a Reid Vapor Pressure less than 7.0 psi, a 10% D-86 distillation point no greater than 158° F., and a paraffin content greater than 70 volume percent; and

(d) unleaded, oxygenated gasolines of octane value at least 87 with a Reid Vapor Pressure less than 7.0 psi, a 10% D-86 distillation point no greater than 158° F., a 50% D-86 distillation point no greater than 215 °F., an olefin content less than 10 volume percent, and the oxygenates are present in a total oxygen concentration no greater than the equivalent provided by about 14.9 volume percent methyl tertiary butyl ether;

(2) delivering said unleaded gasoline to a substantial number of gasoline service stations distributed within a geographical region with significant air pollution caused in substantial part by the emission of exhaust gases from the operation of automobiles within said region; and

(3) dispensing the unleaded gasoline from said gasoline service stations into a substantial number of automobiles for subsequent combustion therein, said automobiles having catalytic converters for treating exhaust emissions.

155. The method of claim 154 wherein the gasoline produced in step (1) is gasoline (a).

156. The method of claim 155 wherein the gasoline produced in step (1) comprises greater than 72 volume percent paraffins.

157. The method of claim 154 wherein the gasoline produced in step (1) is gasoline (b).

158. The method of claim 154 wherein the gasoline produced in step (1) is gasoline (c).

159. The method of claim 154 wherein the gasoline produced in step (1) is gasoline (d).

160. The method of claim 159 wherein the gasoline produced in step (1) has a 50% D-86 distillation point no greater than 210° F.

161. The method of claim 159 wherein the gasoline produced in step (1) has a paraffin content greater than 65 volume percent.

162. The method of claim 161 wherein said unleaded gasoline produced in step (1) contains less than 6 volume percent olefins.

163. The method of claim 162 wherein said unleaded gasoline produced in step (1) has a paraffin content greater than 72 volume percent.

164. The method of claim 117, 157, 158, 159, 161, or 163 wherein the 90% D-86 distillation point of said gasoline produced in step (1) is no greater than 315 °F.

165. The method of claim 164 wherein the 10% D-86 distillation point of said gasoline produced in step (1) is no greater than 140 °F.

166. The method of claim 165 wherein the Reid Vapor Pressure of said unleaded gasoline is no greater than 6.8 psi.

167. The method of claim 166 wherein the 50% D-86 distillation point of said gasoline produced in step (1) is less than 200 °F.

168. The method of claim 166 wherein the 10% D-86 distillation point of said gasoline produced in step (1) is no

greater than 135° F.

169. The method of claim 168 wherein the 50% D-86 distillation point of said gasoline produced in step (1) is less than 200 °F.

170. The method of claim 154, 159, 161 or 163 performed during a time period of one month wherein the amount of said unleaded gasoline dispensed in step (3) during said month is the equivalent of at least 100,000 gallons of gasoline per day.

171. The method of claim 170 wherein the 90% D-86 distillation point of said gasoline produced in step (1) is no greater than 315 °F.

172. The method of claim 154, 155, 157, 158, 159, 160, or 163 performed during a time period of one week wherein the amount of said unleaded gasoline dispensed in step (3) during said week is at least 10,000,000 gallons of gasoline.

173. The method of claim 172 wherein the 10% D-86 distillation point of said gasoline produced in step (1) is no greater than 140 °F. and the 90% D-86 distillation point of said gasoline produced in step (1) is no greater than 315 °F.

174. The method of claim 154 wherein the amount of said unleaded gasoline dispensed in step (3) over the course of one month is equivalent to at least 25% of the amount dispensed by all service stations in said region for said month.

175. The method of claim 117, 154, 155, 157, 158, 159, 160, 161, or 163 wherein, over a six month time period, the amount of said unleaded gasoline produced in step (1) is the

equivalent of at least 25% of the total of the refinery's daily gasoline production over said six month time period.

176. The method of claim 175 wherein the 90% D-86 distillation point of said gasoline produced in step (1) is no greater than 315 °F. and the 10% D-86 distillation point of said gasoline produced in step (1) is no greater than 140 °F.

177. The method of claim 176 wherein the 90% D-86 distillation point of said gasoline produced in step (1) is no greater than 300 °F.

178. The method of claim 142 wherein the gasoline introduced into said engine is unleaded, oxygenated gasoline (f).

179. The method of claim 142 wherein the gasoline introduced into said engine is unleaded, oxygenated gasoline (g).

180. The method of claim 142 wherein the gasoline introduced into said engine is unleaded, oxygenated gasoline (h).

```
22       if t50 ne .;
23       if mtbe ne . ;
24       if mtbe lt 50;
25       if paraf gt 65;
26    run;

NOTE: The infile IN is:
      FILENAME=d:\[redacted]\[redacted]gas.da
      RECFM=V,LRECL=250

NOTE: Invalid data for MTBE in line 45541 213-216.
RULE:      ----+----1----+----2----+----3----+----4----+----5----+----6----+
45541      9003 MIAMI                MOBIL                RU  91.4  82.0  86.7  89.0
      66     88.9                 62.9 12.2          2.44                  108 113
     131    120 124 131  90  94 111 123 132 148 168 192 218 244 279 328 355
     196  380 95.0 1.0 4.0 <0.0 216
CITY=MIAMI COMPANY=MOBIL GRADE=RU YY=90 MM=3 RON=91.4 MON=82.0 AKI=86.7
RVP=12.2 AROM=. OLEF=. PARAF=. T50=192 T90=328 MTBE=. _ERROR_=1 _N_=45541
NOTE: 50633 records were read from the infile IN.
      The minimum record length was 89.
      The maximum record length was 236.
NOTE: The data set WORK.ONE has 0 observations and 15 variables.
NOTE: The DATA statement used 1 minute 21.94 seconds.

27
28    proc print;
      title1 '[redacted] data base subset with';
30    title2 'RVP <= 7.5';
31    title3 'olefins < 10';
32    title4 'T50 <= 215';
33    title5 'T90 <= 315';
34    title6 'paraffins > 65';
35    title7 'prior to 1991';
36    title8 'd:\[redacted]2.[redacted] output';
37    run;

NOTE: No observations in data set WORK.ONE.
NOTE: The PROCEDURE PRINT used 0.59 seconds.
```

Post-it™ brand fax transmittal memo 7671 | # of pages ▸ 1

To Greg Wirzbicki	From Peter Jessup
Co.	Co.
Dept.	Phone # 7389748
Fax #	Fax # 7313277

RVP ≤ 7.5 psi paraffins > 65

Olefin < 10

T50 ≤ 215

T90 ≤ 315

[redacted]URE 1

Niper Gasoline Survey Summer 1976 - 1990 except 1987 16:07 Friday, September 2, 1994 5

RVP <= 7.5 psi, T50 <= 215 F, and T90 <= 315 F

OBS	Rvp (psi)	T50 (F)	T90 (F)	MeOH	EtOH	tBuOH	Other O	TEL	R+M/2	DATE
1	0.0	.	.	.	.	.	.	0.26	89.20	7/86
2	4.5	.	.	.	.	.	.	.	88.05	6/86
3	6.3	205	305	.	.	.	.	3.34	86.50	8/76
4	6.4	205	306	.	.	.	.	0.01	85.80	8/81
5	6.5	202	307	.	.	.	.	.	87.10	8/76
6	7.0	201	299	.	.	.	.	0.01	90.90	6/76
7	7.1	208	309	.	.	.	.	2.24	91.90	8/80
8	7.2	.	.	.	.	.	.	.	87.30	8/90
9	7.2	210	300	.	.	.	.	.	87.60	8/76
10	7.2	214	314	.	.	.	.	.	87.35	6/80
11	7.3	185	305	.	.	.	.	1.40	94.30	6/78
12	7.3	203	314	.	.	.	.	.	87.90	5/79
13	7.3	207	309	.	.	.	.	.	90.65	6/78
14	7.3	210	308	.	.	.	.	.	93.85	8/77
15	7.4	205	303	.	.	.	.	0.03	90.35	6/78
16	7.4	210	302	.	.	.	.	2.60	94.80	8/76
17	7.4	210	305	.	.	.	.	0.05	90.35	6/78
18	7.4	213	302	.	.	.	.	3.24	95.65	8/76

LAR Unleaded Plus 87 - Blend Sheet Data (NOT INCLUDING H-O GRADE)

DATE		BARREL	DEG. API	RVP	V/L	BROMIN	SULFUR	MERCAP	MON	R+M/2	10% PT	50% PT	90% PT	WUN
MAY 10	1989	83.7	55.5	8.1	2	3	36	0.3	83.2	87.3	127	231	352	411
JUN. 21	1989	81.0	59.2	8.1	18	16	144	0.2	83.3	87.3	128	202	351	382
AUG. 26	1988	79.0	57.2	8.1	16	18	273	1.3	82.8	87.4	125	200	350	379
AUG. 30	1988	79.0	59.1	8.1	17	10	228	1.1	82.8	87.4	126	204	328	376
JUL. 24	1989	68.8	55.0	8.0	19	1	19	0.9	82.8	87.2	128	202	317	371
OCT. 26	1989	63.6	62.4	8.0	7	18	136	0.6	83.4	87.2	128	203	326	375
MAY 15	1989	81.4	63.1	8.0	17	25	169	1.2	83.5	87.4	130	198	335	374
MAR. 24	1989	64.3	56.8	8.0	2	1	19	0.9	83.1	87.3	130	192	304	357
AUG. 24	1988	79.0	61.2	8.0	21	16	213	0.9	83.1	87.3	121	188	320	354
AUG. 18	1988	84.0	59.3	8.0	10	2	19	1.0	84.2	87.3	128	195	326	367
FEB. 2	1989	81.4	63.6	7.9	1	13	159	1.0	83.6	87.4	134	199	306	366
MAY 29	1989	83.7	55.8	7.9	7	10	116	0.6	82.8	87.3	127	203	328	375
AUG. 9	1989	71.8	61.0	7.9	19	1	19	0.5	83.7	87.2	128	188	293	348
FEB. 22	1989	84.0	55.5	7.9	1	3	29	0.9	83.3	87.3	135	209	310	378
JUL. 30	1988	83.9	57.0	7.9	13	18	213	1.5	82.8	87.4	130	204	352	386
JUN. 13	1987	58.9	58.6	7.9	21	25	210	1.8	82.2	87.0	115	195	335	364
FEB. 10	1987	73.9	55.2	7.9	2	3	19	3.4	83.0	87.0	122	205	334	377
FEB. 7	1987	68.9	56.3	7.9	1	12	152	5.0	82.5	87.0	125	210	351	389
FEB. 4	1989	81.9	59.7	7.8	1	3	32	0.9	83.5	87.3	127	196	299	358
AUG. 18	1989	73.9	58.7	7.8	14	6	34	0.4	83.6	87.2	122	203	334	375
OCT. 1	1989	59.1	54.7	7.8	6	3	196	0.3	83.4	87.2	129	212	345	391
OCT. 6	1989	79.7	59.0	7.8	9	3	27	1.1	83.9	87.2	123	199	320	366
AUG. 31	1989	81.9	57.3	7.8	11	7	67	0.2	83.4	87.2	131	215	338	392
JUN. 26	1989	71.7	57.9	7.8	21	21	177	0.8	82.9	87.3	126	207	352	387
FEB. 17	1988	78.9	56.7	7.7	1	17	247	3.4	82.6	87.0	130	202	340	380
FEB. 13	1989	82.0	56.7	7.6	0	22	257	1.4	82.8	87.4	136	215	340	395
FEB. 13	1988	80.9	56.1	7.6	1	20	197	2.0	82.6	87.0	128	204	339	380
AUG. 20	1989	81.4	59.1	7.4	12	2	31	1.1	83.8	87.2	134	209	320	381
JUL. 1	1988	39.4	56.0	7.4	8	1	23	1.1	83.0	87.0	128	200	309	366
AUG. 2	1988	59.3	58.6	7.3	11	1	19	1.9	84.0	87.3	125	194	329	365
SEPT. 30	1989	83.6	54.2	7.2	6	12	109	1.0	82.8	87.2	132	213	340	391
AUG. 15	1989	59.1	56.1	7.1	10		19	0.4	83.3	87.2	126	205	332	378

UNLEADED REGULAR GASOLINE (87 OCTANE)
(C AND M/H GRADES)

BLEND NUMBER			185	196	203	212	219	234	245	248	254
TANK NUMBER	SPEC SHEET		8528	9526	8528	8526	8528	8526	8528	8206	9526
SAMPLE NUMBER	G-12/G13		2269	2396	2471	2573	2654	2818	2936	2963	3010
DATE BLEND COMPLETED	DATED		06-02-88	06-10-88	06-16-88	06-24-88	07-01-88	07-13-88	07-21-88	07-23-88	07-27-88
BARRELS BLENDED	6-17-85		54.8	39.4	64.0	39.4	39.4	79.0	79.6	79.0	79.0
GRADE			M-H	M-H	M-H	M-H	M-H	M-H	M-H	C	M-H
UNIFINED C5/C6			18.97	30.87	27.76	27.83	34.67	35.57	15.72	10.17	12.93
UNISOL LT CAT GASO			13.82	21.88				5.40		19.51	16.46
U33 AVIA BASE STOCK								14.00			
U80 REFORMATE			14.58	3.45	5.58		23.14	11.19	13.56	21.72	15.55
U110 LITE ALKY			0.65								
BLENDING BUTANE	No MTBE		0.09	0.21	1.11	1.37	0.26	0.41	1.16	2.19	0.18
U120 LT UNICRACKATE			0.35	1.36	5.62	20.27	15.64		24.70	25.20	29.02
U60 REFORMATE			9.71	16.15	22.66	35.51		8.14	32.55	11.20	23.16
U60 UNIF HVY CAT GASO			2.59		1.43			2.87	3.89	2.92	1.08
MOTOR ALKY			11.06					7.63	3.42		1.60
U100 REFORMATE				21.25	13.18	15.03	26.29			2.99	
OFFSHORE GASO			28.19	4.84	22.46			14.79		4.11	
INTERFACE						F526					
GRAVITY API 60 F.			58.3	55.8	55.4	57.2	56.0	56.5	55.8	60.6	57.6
APPEARANCE	CLEAR/BRIGHT		C/B	C/B	C/B	C/B	C/B	C/B	C/B	C/B	C/B
CORROSION 3 HOURS 122 F.	1 MAX		1A	1A	1A	1A	1A	1A	1A	1A	1A
VAPOR PRESS REID	SPEC/RESULT		90MX83	90MX83	90MX86	90MX83	90MX74	90MX82	90MX86	115MX96	90MX86
30 DAY AVERAGE	SPEC/RESULT		90MX84	90MX84	90MX84	90MX84	90MX82	90MX81	90MX82	115MX96	90MX82
V/L RATIO	22 MAX		140T21	140T19	140T16	140T21	140T8	140T14	140T16	127T8	140T21
30 DAY AVERAGE	20 MAX		16	19	18	13	17	14	15	8	16
GUMS EXISTENT MG/100 ML	4.0 MAX		0.8								
ISD RATING	100 MAX		39								
OXIDATION STAB MINUTES	240 MIN		1440	1020	900	1050	1440	810	1440	735	1050
BROMINE NUMBER G/100G	28 MAX	1*	19	18	2	7	1	9	9		16
SULFUR PPM	300 MAX	2*	225	232	45	92	23	101	105	243	174
MERCAPTAN SULFUR PPM	5.0 MAX		2.6	2.6	1.2	1.5	1.1	1.0	0.9	1.2	1.1
30 DAY AVERAGE	4.0 MAX		1.7	1.8	1.7	1.9	1.8	1.1	1.0	1.2	1.0
LEAD, GM/GAL	0.02 MAX		0.007	<0.005	<0.005	<0.005	<0.005	<0.005			
LEAD, GM/GAL (TANK)	0.02 MAX		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
MOTOR OCTANE	82.0 MIN		82.62	82.52	82.61	83.34	83.04	82.65	82.76	82.46	82.57
30 DAY AVERAGE	RESULT		82.71	82.64	82.63	82.74	82.79	82.83	82.57	82.46	82.57
OCTANE NO (R+M)/2	87.0 MIN		87.03	87.41	87.02	87.03	87.05	87.03	87.01	87.08	87.05
30 DAY AVERAGE	RESULT		87.15	87.23	87.19	87.10	87.09	87.03	87.02	87.08	87.05
EP DEGREES F	432 MAX		426	416	429	405	391	425	429	414	412
RECOVERY VOL PCT	95.0 MIN	3*	99.0	96.5	97.5	97.0	97.0	99.0	97.0	97.0	96.0
RESIDUE VOL PCT	2.0 MAX		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
EP 30 DAY AVERAGE	430 MAX		413	413	416	421	408	407	409	414	410
10% EVAP DEGREES F	SPEC/RESULT		158MX124	158MX114	158MX126	158MX126	158MX124	158MX127	158MX121	140MX117	158MX118
50% EVAP DEGREES F	170 MIN SPEC MAX		253MX200	253MX150	253MX215	253MX196	253MX200	253MX199	253MX212	243MX170	253MX194
90% EVAP DEGREES F	SPEC/RESULT		374MX342	374MX330	374MX345	374MX317	374MX309	374MX332	374MX358	365MX322	374MX343
WARM UP NUMBER	SPEC/RESULT		432MX376	432MX347	432MX392	432MX364	432MX366	432MX372	432MX392	412MX335	432MX367
30 DAY AVERAGE	SPEC/RESULT		425MX380	425MX378	425MX380	425MX373	425MX372	425MX375	425MX376	405MX335	425MX375

1* APPLIES TO MH GRADE ONLY
2* C GRADE MAX IS 1000 PPM
3* DOES NOT APPLY TO C GRADE

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```
1     *  d:\niper\lit75uc.sas
2     *  This program reads in the literature fuels and searches for any
3     *  fuels that have RVP < 7.5 psi, T50 <= 215F, T90 <= 315F,
4     *  paraffins > 65%, olefins < 10%, R+M/2 >= 87, and are unleaded
5     *  and contain oxygenate
6     ;
7
8     options pagesize =43 linesize =80;
9
10    data one;
11      infile 'd:\niper\lit75uc.dat' missover;
12      input public $ 1-13 page $ 14-18 table $ 19-25 fuel $ 27-35
13            rvp 36-38 t50 40-42 t90 44-46 olef 48-51 arom 53-56
14            sats 58-61 lead $ 62-63 ron 64-68 mon 70-73 mtbe 75-78
15            etoh 79-82 etbe 84-87 ipa 89-92 tba 93-97
16            comments $ 99-121 rm2 122-127 owt 128-132 ;
17            r = (ron + mon)/2;
18            if r = . then r = rm2;
19            rm = round(r,.1);
20            mtbe = round(mtbe,.1);
21            etoh = round(etoh,.1);
22            etbe = round(etbe,.1);
23            ipa  = round(ipa,.1);
24            tba  = round(tba,.1);
25            length calc $ 1;
26            if sats = . and arom ne . then do;
27             sats = 100 - arom - olef;
28             calc = '*';
29            end;
30             tot   = arom + olef + sats;
31           total = round(tot,1);
32          if lead ='?' then lead ='P';
33          if rvp < 7.5;
34            if rvp ne .;
35            format rm 5.1 ;
36          if olef < 10;
37          if sats > 65;
38          if T90 <=315;
39          if T50 <=215;
40          if rm >= 87;
41          if mtbe ne . or
42              etbe ne . or
43              etoh ne . or
44              ipa  ne . or
45              tba  ne . ;
46    title1 "Fuels Survey";
47    title2 "Publications Pre '91 in SN 08/077,243 f. 6/14/93 Jessup et
al.";
48    title3 'RVP <= 7.5, T50 <= 215F, T90 <=315F, and Grade = Unleaded';
49    title4 '>= 87 Octane, <10% Olefins, >65% Parafins, Oxygenated';
50
51          label rm = 'R+M/2'
52                rvp = 'Rvp*(psi)'
53                T50 = 'T50*(F)'
54                T90 = 'T90*(F)'
55                arom = '%*Arom-*atics'
56                olef = '%*Ole-*fins'
```

```
   57                    sats = '%*Satu-*rates'
   58                    total = 'T*(2)'
   59                    public = 'Article*(4)'
   60                    lead = 'NB*(3)'
   61                     page ='Pg*(5)'
   62                     table = 'Table*(5)'
   63                    fuel = 'Fuel'
   64                    calc = 'C*(1)'
   65                    mtbe = 'MTBE*(%)'
   66                    etoh = 'EtOH*(%)'
   67                    etbe = 'ETBE*(%)'
   68                    ipa = 'IPA*(%)'
   69                    tba = 'TBA*(%)'
   70                    comments = 'Comments'
   71                     ;
   72
   73
   74     proc sort;
NOTE: The infile 'd:\niper\lit75uc.dat' is file D:\NIPER\LIT75UC.DAT.
NOTE: 293 records were read from the infile D:\NIPER\LIT75UC.DAT.
      The minimum record length was 129.
      The maximum record length was 129.
NOTE: Missing values were generated as a result of performing an operation on
      missing values.
      Each place is given by: (Number of times) at (Line):(Column).
      268 at 20:27
      283 at 21:27
      291 at 22:27
      291 at 23:26
      291 at 24:26
      124 at 17:14
      49 at 19:22
      210 at 30:18
      105 at 31:27
      27 at 27:17
NOTE: The data set WORK.ONE has 0 observations and 26 variables.
NOTE: The DATA statement used 9.00 seconds.
   75        by rvp descending T50 descending T90;
   76     proc print label split = '*' r uniform;
NOTE: The data set WORK.ONE has 0 observations and 26 variables.
NOTE: The PROCEDURE SORT used 1.00 seconds.
   77     var   rvp t50 t90 olef arom sats calc total
   78           mtbe etoh  etbe ipa tba rm lead public page table fuel comments;
   79
   80     run;
WARNING: No observations in data set WORK.ONE.
NOTE: The PROCEDURE PRINT used 0.00 seconds.
```